AUGUST 1951

FOUNDRY

THE STUDEBAKER STORY

—see page 72

Foundries that specialize in Quality Castings flux and desulphurize with PURITE

A modern cupola and forehearth installation used in the manufacture of farm equipment parts and critical machine castings at the Lynchburg Foundry Company, Lynchburg Plant.

Lynchburg Foundry Company—long famed for casting quality farm equipment parts, castings for the chemical industry, critical machine parts and iron pipe—relies on Purite to give increased fluxing action in cupolas and to reduce sulphur in ladle or forehearth.

Here's why so many leading foundries use Purite:

- Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
- Purite gets to the iron quicker—no faster desulphurizer made.
- Purite is time-tested and proven for unsurpassed desulphurizing uniformity.
- Purite comes in 2-lb. pigs—no weighing or measuring required.
- Purite is 100% fused soda ash—you do not pay for inert materials.
- Purite does not crumble—no waste—no dust.
- Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

PURITE is sold by all leading foundry supply houses in the United States and Canada.

Nearly 30 years of successful experience prove why Purite is today's outstanding flux and desulphurizer. Get full information on Purite's effectiveness—write today for new booklet, "Refining and Desulphurizing in the Cupola." Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

PURITE 100% fused soda ash.

The Scientific Flux for Better Melting and Cleaner Iron.

Mathieson
CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

DUCTILE IRON

approaches properties of cast steel; is readily produced by GRAY IRON FOUNDRY PRACTICE

The Chris Erhart Foundry & Machine Co., Cincinnati 3, Ohio, produced this Jordan plug, requiring strength and toughness, in ductile iron for Black-Clawson Co., a leading manufacturer of pulp and paper mill equipment.

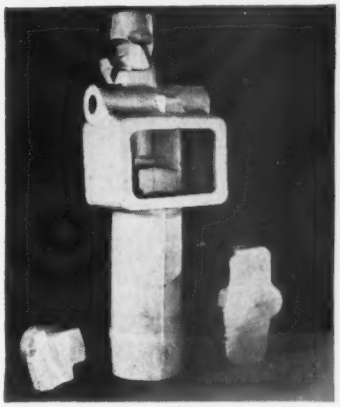
• • •

This high strength clamp can take a 90° twist without cracking or fracture ... because it is ductile iron ... cast for The Langslow Corporation, Rochester 9, N. Y., by The Acme Shear Company, Bridgeport 1, Conn.

DUCTILE IRON is a cast ferrous product that combines the *process advantages* of cast iron with many of the *product advantages* of cast steel.

In less than two years, ductile iron has attained wide acceptance, because it offers excellent castability, high mechanical properties, and good machinability. Parts cast in ductile iron show superior strength and pressure-tightness, high modulus and resistance to shock.

Typical current applications include bombsight parts, clutch drums, dies for automotive fenders and bumpers, electrical fittings, pistons for diesels, side frames for forging hammers, sprockets & gears, and many other parts.



Bison Castings, Inc., Buffalo, N. Y., cast this hydraulic jack cylinder in ductile iron for strength and pressure-tightness. Note, at right and left, sections cut from castings to show soundness.

AVAILABILITY

Send us details of your prospective uses, so that we may suggest a source of supply from some 100 authorized foundries now producing ductile iron under patent licenses. Request a list of available publications on ductile iron . . . mail the coupon now.

The International Nickel Company, Inc.
Dept. F., 67 Wall Street, New York 5, N. Y.

Please send me a list of publications on: **DUCTILE IRON**

Name..... Title.....

Company.....

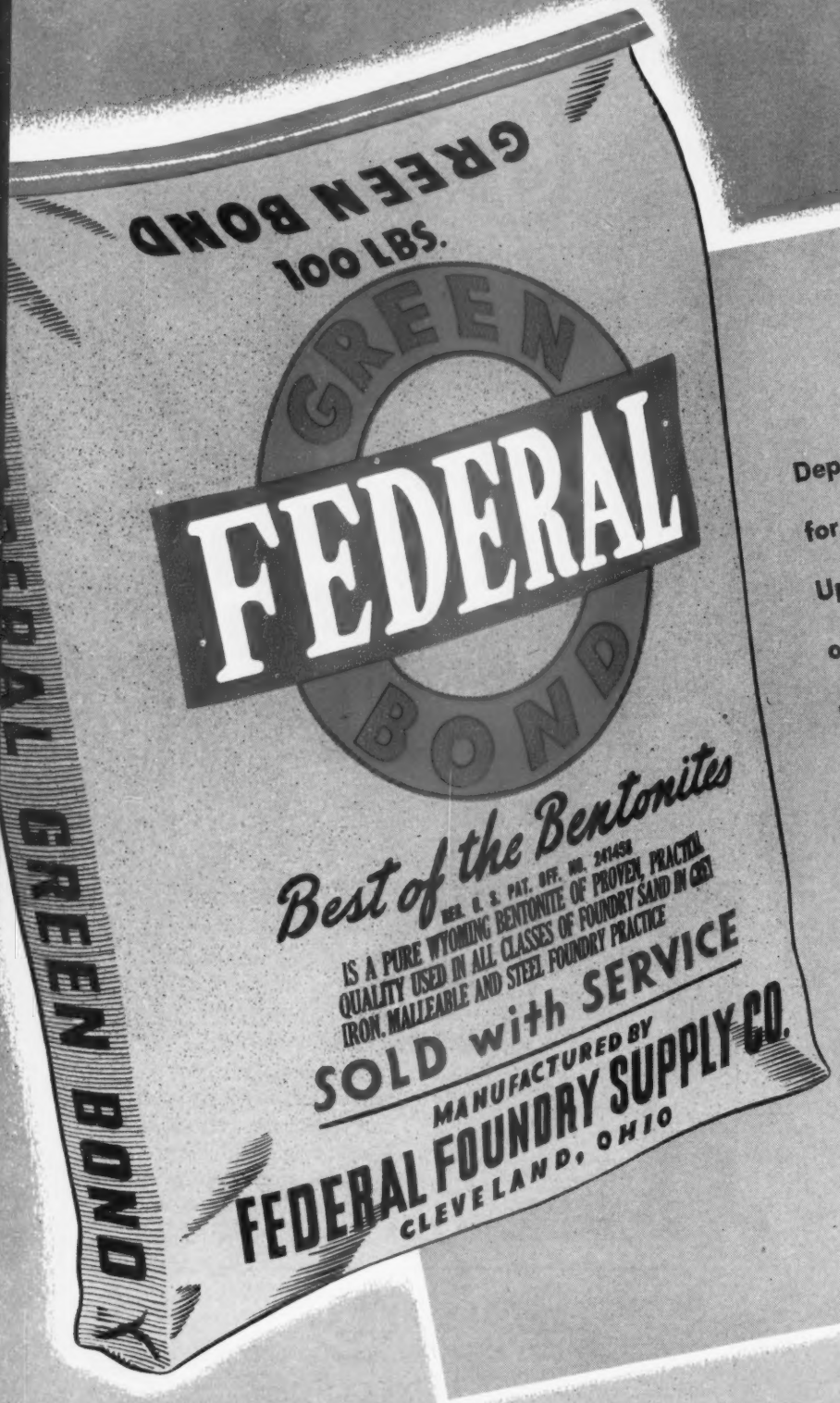
Address .....

City..... State.....

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

STILL THE *Best* OF THE BENTONITES!


GREEN BOND
100 LBS.
GREEN
FEDERAL
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Best of the Bentonites
REG. U. S. PAT. OFF. NO. 241458
IS A PURE WYOMING BENTONITE OF PROVEN, PRACTICAL QUALITY USED IN ALL CLASSES OF FOUNDRY SAND IN GREY IRON, MALLEABLE AND STEEL FOUNDRY PRACTICE
SOLD with SERVICE
MANUFACTURED BY
FEDERAL FOUNDRY SUPPLY CO.
CLEVELAND, OHIO
GREEN BOND

Deposits of the finest Bentonite clay for foundry use are located near Upton, Wyoming. Here, on Federal-owned property, GREEN BOND is mined, dried and pulverized, to produce bonding clay of the finest quality and uniformity. From the very beginning, GREEN BOND has been the best of the Bentonites!

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AUGUST 1951

FOUNDRY

VOLUME 79—NUMBER 8

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Reduce Core Baking Fuel Costs

26% WITH INDUCTOL

INDUCTOL BAKES AT 350° — CUTS FUEL CONSUMPTION ¼

If you are baking your cores at 450°, every ton of core sand absorbs approximately 235,000 B.T.U.'s of heat energy. However, by reducing oven temperature to 350°, that same ton of core sand needs only 175,000 B.T.U.'s—a reduction of nearly 26% in heat requirement.*

This actually means that 26% less fuel is needed to bake cores at 350°, as compared to 450°. In other words, you can *save* about *$250.00 out of every $1000.00** spent for fuel merely by reducing your baking temperatures one hundred degrees.*

NO LOSS IN BAKING SPEED

Inductol is the only core oil that bakes efficiently at 350°. Even at this low temperature, *Inductol* bakes faster than ordinary core oils do when baking at 425° or higher. Important, too, is the fact that Inductol gives greater tensile strength at 350° than at any higher temperature.

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Foundry Products Division

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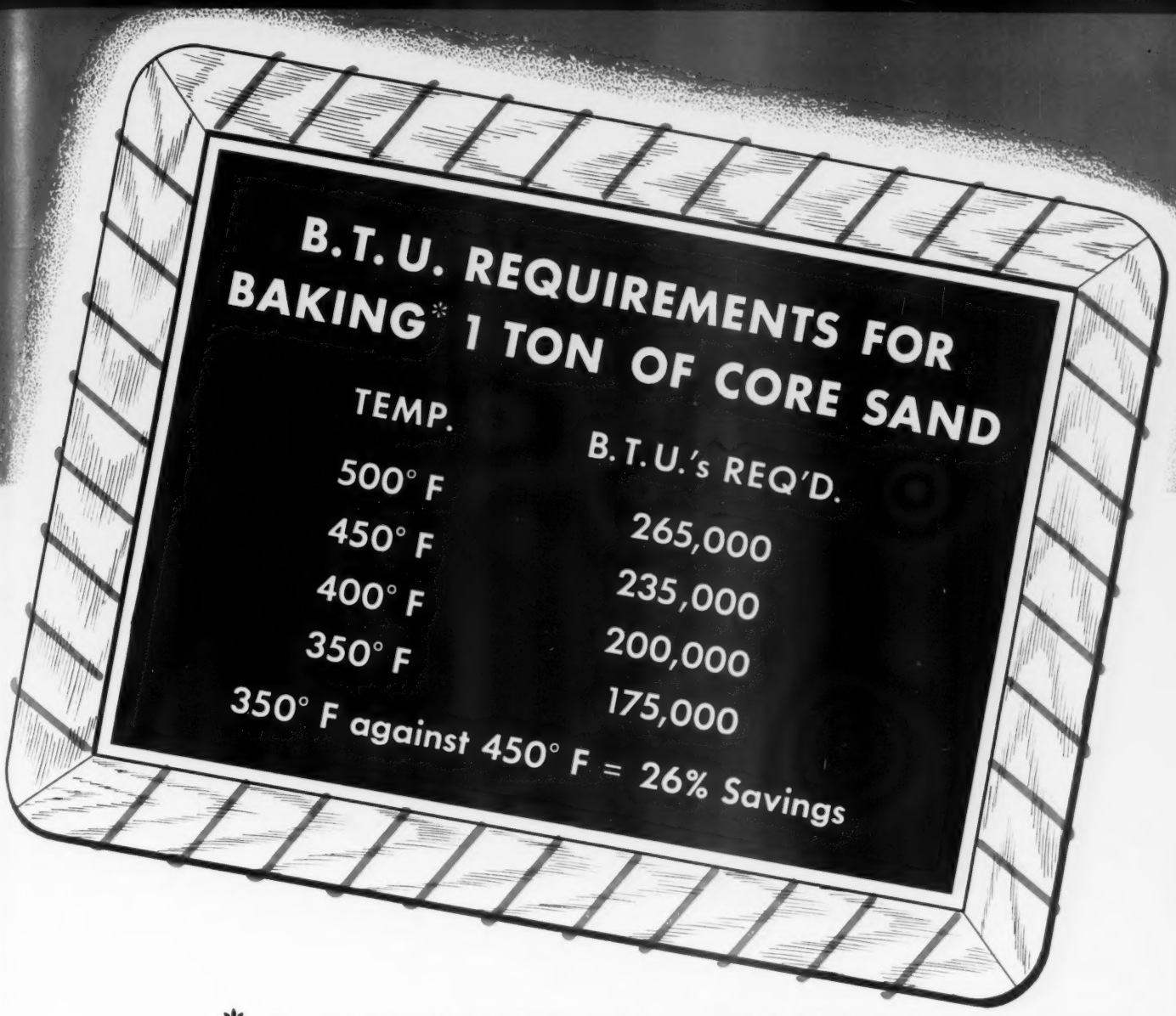


* Figures are verified by heating engineers of a leading core oven manufacturer. They represent an average of many types of ovens, baking conditions, and core sand mixtures.

ASK YOUR LINOIL MAN ABOUT INDUCTOL

For a free sample or for further information on how *Inductol* can save you *Core Baking Dollars*, use the coupon or call A.D.M. direct.

GET THE FACTS ABOUT INDUCTOL

ARCHER-DANIELS-MIDLAND COMPANY
Foundry Products Division, 2191 West 110th Street, Cleveland 2, Ohio

Please send sample of *INDUCTOL* _____
Please have representative call _____
Please send Bulletin F 108 _____

Name _____

Company _____

Street _____

City and Zone _____ *State* _____

Pangborn ROTOBLAST Rooms save time, money and labor. As shown here one man can handle all work easily with an overhead crane and the rotative table.

CLEAN LARGE CASTINGS AT LOW COST

with Pangborn ROTOBLAST* Rooms

IF you clean large castings, investigate the economy and speed of modern Pangborn ROTOBLAST Rooms. They combine all the features of standard Pangborn Blast Cleaning Rooms with ROTOBLAST . . . the modern airless blast cleaning method developed by Pangborn that saves up to 87% on power alone!

You can specify any size, width, length or height required; work may be handled by monorail conveyor, hoist, movable car or rotative table (as shown above). Ceilings may be hinged for hoist or crane operation and roll-up doors are available. Operation is easy and simple because entire work area is flooded with light.

Only one man is needed for fast, efficient operation. One company* for example, reports savings of $10,160 on labor over their old-style room and has reduced their cleaning time by two-thirds.

More than 28,000 Pangborn machines serving industry.

(*Name on request)

WRITE FOR FULL INFORMATION. To get specific information on Pangborn ROTOBLAST Rooms, outline your problem in a letter. There is no obligation. Just tell us what you make, what you clean and how much you clean per day. Write today to: Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

If you haven't heard it . . . IT'S NEWS!

HERE'S AN INFLATION NOTE: If you really think old soldiers just "fade away," try squeezing into those sailor pants or the GI jacket you wore in World War II.

* * *

ACCORDING TO the Wall Street Journal, living in the past has one big advantage—it's cheaper.

* * *

PSYCHIATRIST: The last man you talk to before you start talking to yourself.

* * *

POEM: The rain is raining all around, It rains on all the nations; It rains a lot on many things, But mostly on vacations.

* * *

FRIEND OF OURS back home writes that he has discovered a sure cure for dandruff—a famous invention called the guillotine which came into use during the French Revolution.

* * *

OF COURSE, our friend's dandruff cure is a bit on the drastic side, but then he always was one to do things the hard way. If he were a foundry superintendent with a manpower problem to solve, he'd probably ignore labor-saving machines like Pangborn Rotoblast and spend his time trying to hire more workers.

* * *

IF YOU have manpower problems, solve them the easy way with Pangborn equipment which is designed to double output per cleaning room man-hour. Drop us a line today.

* * *

TO ERR IS HUMAN. But if you wear out the eraser before you've half used up the pencil, you're overdoing it.

* * *

A TRUE FRIEND is a person who knows all about you and still likes you.

* * *

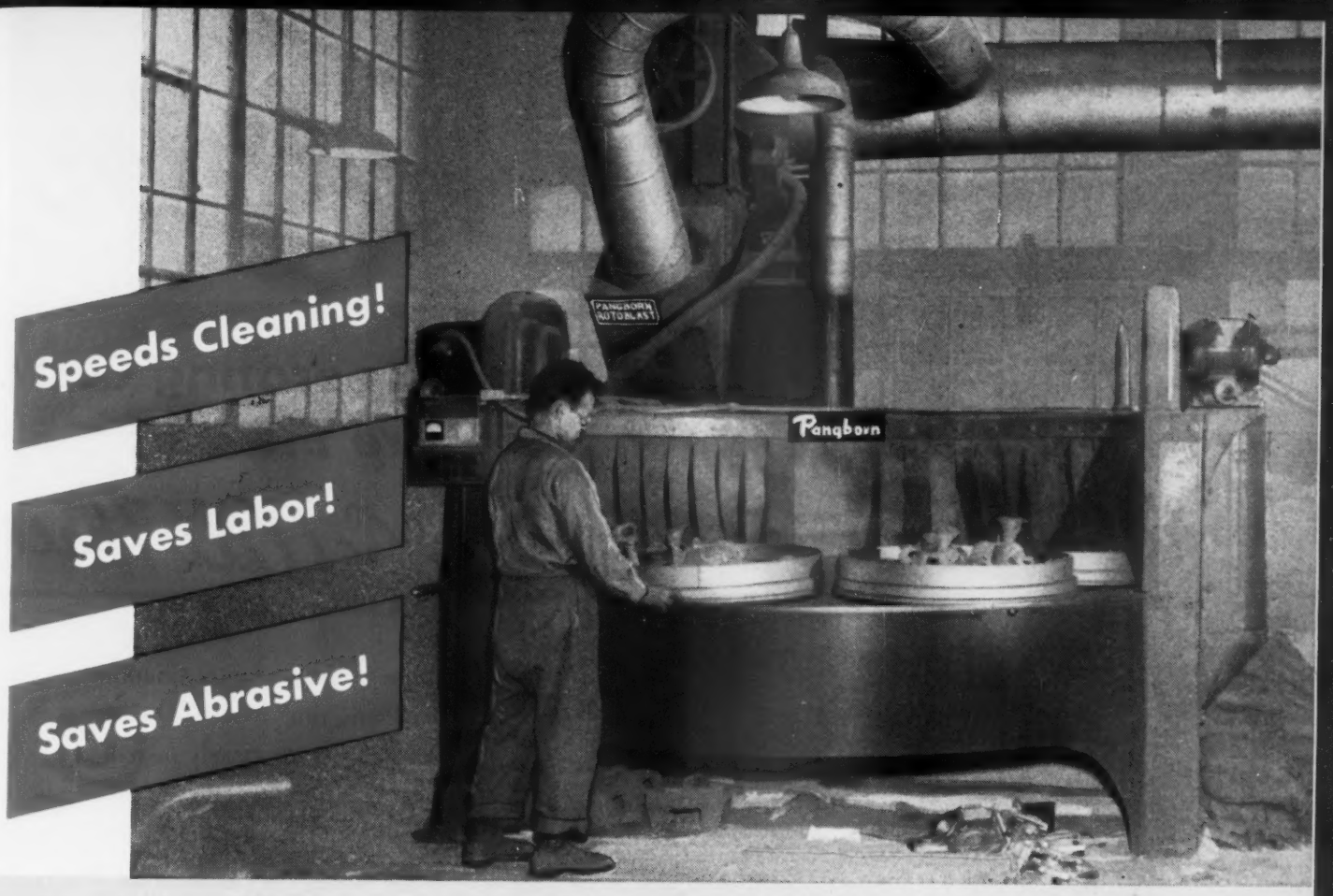
FOR ANY STILL-UNHANGED war criminals left over from World War II, we recommend the maximum punishment: instead of a nice clean jail we figure they ought to be set loose to worry about taxes, shortages, politics, the atomic bomb and the high cost of living—just like the rest of us.

* * *

SOONER OR LATER it was bound to happen: a Long Island restaurant now advertises a new dish for children—Hopalong Casserole.

* * *

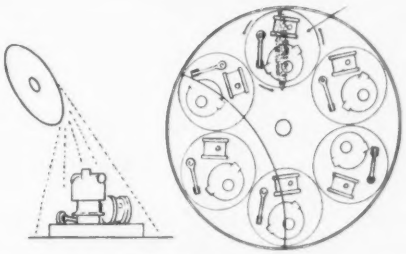
FIRST A MAN learns to talk. Then after many years he learns to keep still.



Read how this Pangborn "LG" ROTOBLAST* Table CUTS CLEANING COSTS by $5556.00 A YEAR

PROFITABLE BLAST CLEANING! That's the story at the Anstice Co. in Rochester, N. Y. Their Pangborn "LG" ROTOBLAST Table shown above has cut labor costs by $2540.00 a year—even though tonnage has increased! In addition, abrasive costs have been cut by $3016.00 a year because ROTOBLAST makes full use of long-lasting Malleabrasive grit (it can be used for up to 300 passes!) As Ken Proud, Foundry Manager sums it up: "We are more than satisfied with results!"

You'll be more than satisfied with



Pangborn "LG" ROTOBLAST Tables too because they're designed for fast, low-cost cleaning of intricate and fragile work. As shown above they clean *completely* because abrasive is hurled at a 45° angle to the work. And *uniform* cleaning is assured because auxiliary tables revolve castings under blast stream.

No matter what you clean, Pangborn has a standard ROTOBLAST Table designed for your job. Included in the standard line are *Turn-Style* Tables for bulky castings . . . and *Table-Rooms* for jobbing work. For full information on the right Pangborn ROTOBLAST Table for your job, write to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

ROTOBLAST . . .

- **SAVES LABOR** with push-button operation
- **SAVES SPACE** because machines are compact
- **SAVES TIME** by cleaning more loads per day
- **SAVES POWER** since no compressor is needed
- **SAVES TOOLS** because all scale is removed

MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

*Trademark of Pangborn Corporation

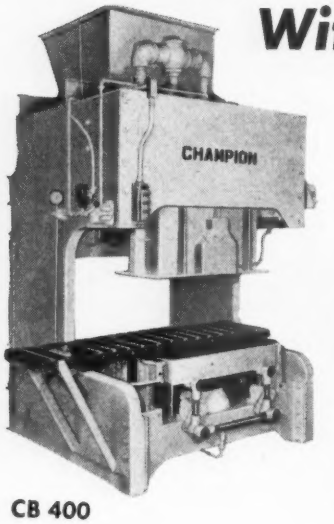
You're Sure to Win

Which Means Most to You:

Quality, Quantity, or Low Operating Costs?

With a Champion Core Blower,

You Get All Three!



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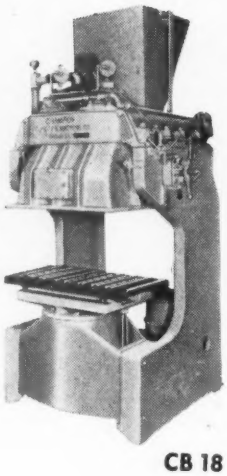

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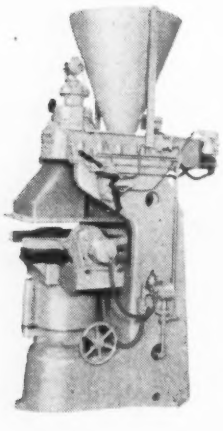

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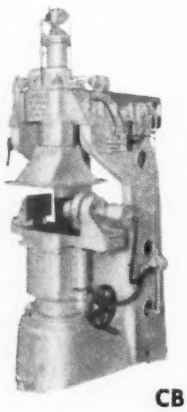

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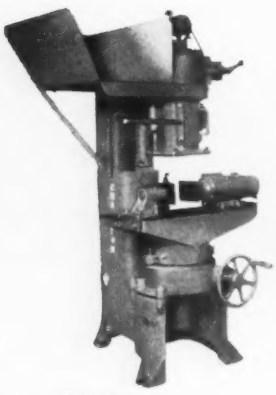

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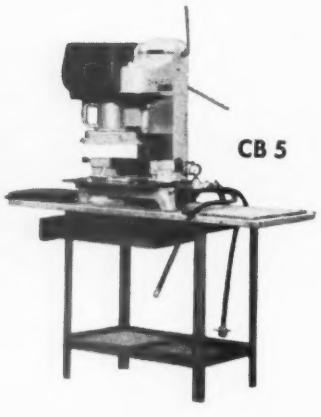


CB 5

And you don't have to figure Champion savings only on the "long run" basis. Day to day economy of operation shows up clearly in reduced power costs, easier operation that eliminates fatigue, precision and uniformity that avoid waste.

The long term economies are there, too. Stamina and precision built into every Champion insures the same trouble-free, quick, easy operation over the years, without costly down-time or maintenance.

When a Champion Core Blower is installed in a foundry, that is the beginning—not the end—of our interest in it, which continues as long as it is in service.

HOW FREE IS AIR?

Any foundry superintendent knows it costs money to keep an air line filled, and the higher the pressure, the more it costs.

Champion Core Blowers and Molding Machines, among their various excellent features, operate on pressures as low as 85 lbs. with great ease and full efficiency. *Excessive Pressures are the Principal Cause of Core Box Wear and High Machine Maintenance. Where Exceedingly High Pressures are Carried in the Line, Regulators are Recommended.*

Plants equipped entirely with Champion machines, enjoy a substantial saving in general operating costs, at no sacrifice in productive efficiency.

...rith Champions!

...eport from Another Satisfied User

(The Champion roll-call is world-wide.)

Original and translation of letter recently written by the builders of Lancia Automobiles, Turin, Italy:

LANCIA & C. FABBRICA AUTOMOBILI - TORINO - S.p.A.

CAPITALE SOCIALE L. 80.000.000 INTERAMENTE VERSATO

Spett. Ditta
Fratelli MUSSO
Corso Bramante 56
TORINO

Torino, 22 Febbraio 1951.

N/ riferimento TEPRO/2248

Oggetto: Macchine "CHAMPION".

Riferendoci alla pregiata Vs/ del 6 Febbraio 1951 abbiamo il piacere di comunicarVi che le Sc... CHAMPION installate presso la ... hanno dato ottimi ...

Gentlemen:

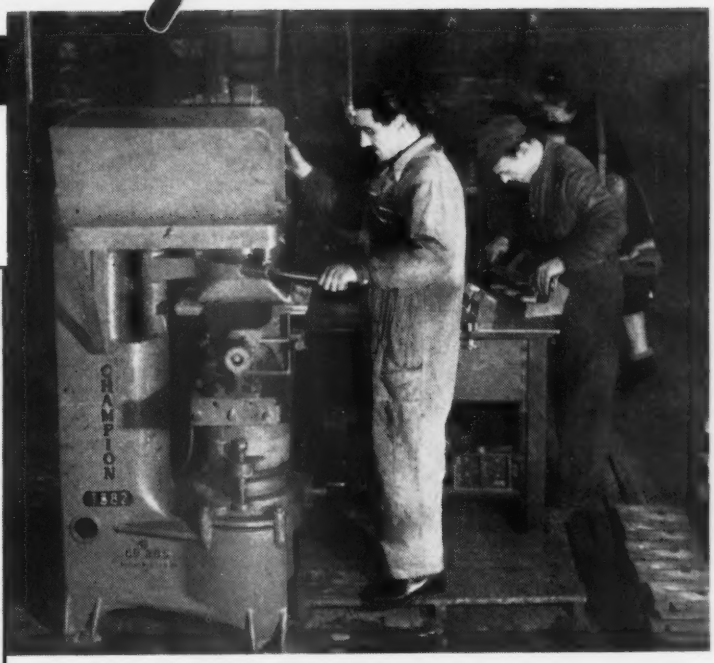
With reference to your letter of February 6, 1951, we are pleased in informing you that the Champion Core Blowers installed in our Bolzano Foundry are giving very satisfactory results, both from the operating and output points of view.

We shall therefore be pleased if you will convey to the manufacturers our most sincere satisfaction.

As requested by Messrs. Champion Foundry & Machine Company, we send you herewith two photographs illustrating the Champion Core Blowers operating in our foundry.

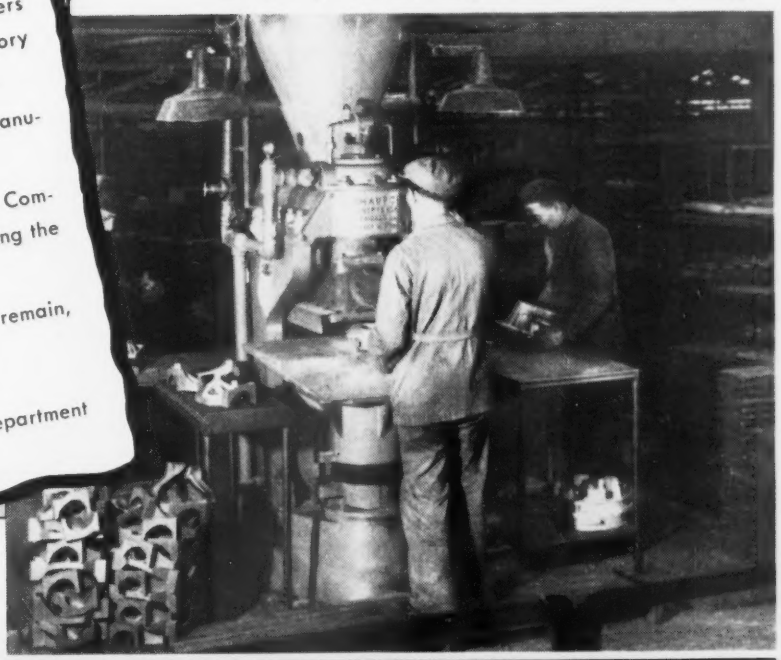
We hope this is to your satisfaction, and meanwhile remain,

Yours very truly,
LANCIA & CO.
Technical Production Department
s/Armando Pilotti.



Champion CB 15 Core Blower in Lancia foundry.

Champion CB 10 Core Blower in Lancia foundry.



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FOUNDRY AND MACHINE COMPANY

OFFICE, 1553 W. MADISON STREET, CHICAGO 7, ILL.
AL OFFICE AND PLANT • ROCKFORD, ILLINOIS
ING MACHINES • CORE BLOWERS • THE ELECTRIC RIDDLE

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BETTER BUILT
for faster,
More Accurate Work!

BRADFORD

Heavy Duty

PEDESTAL GRINDERS

BRADFORD "Metalmaster" Grinders are designed and engineered to handle your external grinding and tool sharpening operations with greater efficiency and economy. Heavy Duty Model 200 (illustrated) has motor totally enclosed to N.E.M.A. specifications. Ball bearings sealed in dustproof housings are used throughout. Spindle is chrome-nickel steel. Wheel guards are adjustable radially and have hinged doors. Construction includes exhaust connections, spark breakers, eye shields, positive shaft lock, tool tray and waterpot. Meets American Safety Code standards.

220-440, 550 volts, 50 or 60 cycles, 2 or 3 phase. SIZES: 2, 3, 5, and 7½ HP.

Many other models and sizes. See your Bradford Distributor or write us about your grinder problems.

Portable Electric Drills • Saws • Sanders • Polishers • Bench Grinders • Pedestal Grinders • Buffers

THE BRADFORD MACHINE TOOL CO.

661 Evans St. Cincinnati, Ohio

Precision Since 1840

With the EDITORS

THE Roving Kind: The number of foundrymen possessing migratory instincts seems to be far above the general average. Due to these roving habits, the amount of mail reaching our circulation department is tremendous, because readers want to be sure that FOUNDRY follows them wherever they go. Since so many of you write to that department now and then, the editors thought you would

like to meet the people who handle your letters and follow through on the necessary changes in stencils are made.

Rand Ebersole recently took over the work of manager of the circulation department. Rand has been with Penton for 22 years, and for some time has had contact with foundrymen through handling the compilation of *Penton's Foundry List* which appears every two years. Since 1946, Rand has done a fine job in erecting, manning and tearing down the FOUNDRY exhibit at the AFS foundry shows. Since he already has been inoculated with the serum which makes people like the foundry industry, we know that he is going to be happy in seeing that your requests to the circulation department are handled quickly.

Of course we do not think it would be fair to introduce the boss of the department without including his helpers. So glance at the bottom of the page and meet the three young ladies of FOUNDRY circulation, reading from left to right: Frances Guercio, Bettie Thompson, Dolly Jones.

—o—

Wins an Oscar: Managing Editor Bill Gude is the proud possessor of a "Red Feather Oscar," which was presented to him recently by the Minute Men Committee of the Cleveland Community Chest. Bill was one of the ten charter members of that committee and during the past five years has participated in the Community Fund promotion work, and especially in the Minute Men "I Found a Story" radio broadcasts. Congratulations, Bill, on a job well done.

—o—

Unusual: After attending all types of foundry conventions and meetings for nearly thirty years, we have heard a wide variety of committee reports. But we think the prize report, from several angles, was presented at the recent annual meeting of the Malleable Founders' Society by C. M. (Mac) Lewis, president, Badger Malleable & Mfg. Co., South Milwaukee.

(*Concluded on page* 12)

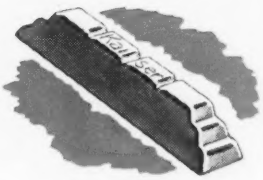
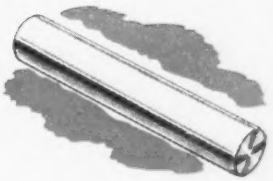
Engineering Assistance and technical

advice on any aluminum casting

or extrusion problem is yours for the

asking to help you make better use of

Kaiser Aluminum pig, specification

ingot  or extrusion billets 

▶ Aluminum pig, specification ingot, extrusion billets. Sales offices in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.

Kaiser Aluminum

A major producer of aluminum pig, specification ingot and extrusion billets

He has the "drop" on a grinding problem

SIMONDS
ABRASIVE CO.
Grinding Wheels

Smart operator! He's suggesting Simonds wheels to speed up a grinding department slowdown. Could also be a happy hint to help *you* chase those bottleneck blues. Simonds Abrasive Company's complete line has everything you need for greater efficiency . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all top quality production tools backed by almost 60 years of Simonds know-how as a major manufacturer of grinding wheels. Write for data book and name of your nearby distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page* 10)

Wis. Reporting as chairman of the program committee, Mac stated that during the year, his committee, with the assistance of Managing Director Ryan, had succeeded in providing good programs for the various general meetings of the society. In fact, Mr Ryan's assistance had been so great that the committee was being disbanded, and in the future, the managing director would take over. The applause following the report was most generous. Evidently the audience realized that here was something unusual, because we humans seldom dissolve an organization, a committee, a task force or any organized group, once it has been formed and, as they say in Washington, activated.

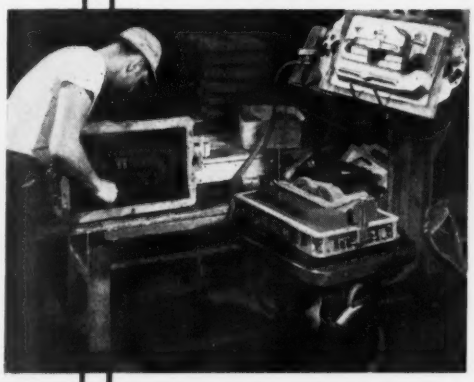
—o—

Honor for Delport: It really is getting bad when the editors have to depend upon their own editorial copy to learn of honors conferred upon a member of the staff. But it did happen last month, for it was not until we were editing the report of the annual meeting of the Institute of British Foundrymen for this issue that we learned that Vincent Delport, European manager of FOUNDRY, was again elected to the Council of that splendid organization. Vincent is exceptionally well known to foundrymen of Great Britain and the Continent. He is a past president of the London branch of the Institute, and attended Council meetings as a representative of the branch. He first was elected to the Council in 1933 and served continuously until 1945. Vincent has devoted much time and effort to the work of the International Committee of Foundry Technical Associations, and was elected to the presidency of that group in 1936. In 1946 he attended the International Foundry Congress in Cleveland, and was active in the reorganization of the international group. F.G.S.

VINCENT DELPORT

PROOF IS IN USE

—IN ACTUAL INCREASED PRODUCTION



At Bruce Foundry & Mfg. Co., Tecumseh, Michigan you see only

FREMONT MAGNESIUM SLIP FLASKS
and
FREMONT CAST IRON JACKETS

These stronger, though lighter, flasks are easier to handle, assure more exacting work, and withstand long, continuous usage in machine molding. The one-inch GROOVLOCK FOOLPROOF PIN, particularly adapted to cope or drag pattern jobs, is your guarantee of perfect alignment indefinitely.

Fremont precision machined and drilled cast iron or cast aluminum jackets have a bolted corner construction which saves you real money. New sides or ends can be inserted by simply removing a few bolts. The entire jacket need not be scrapped.

Write today for free literature.

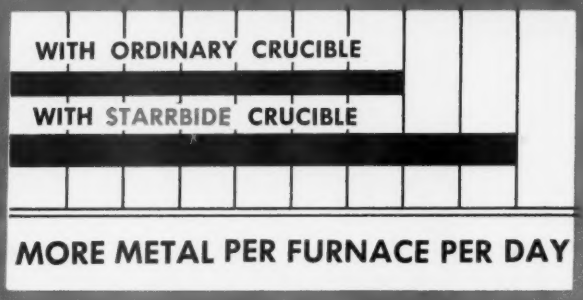
THE **Fremont FLASK CO.**

FREMONT, OHIO

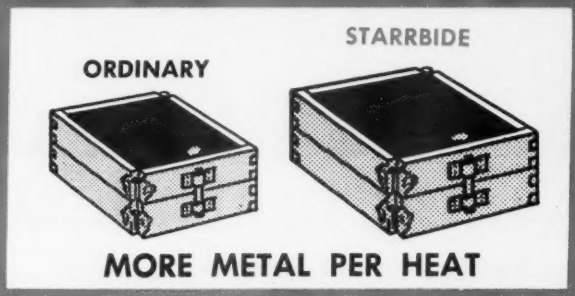
★ STARRBIDE

CARBON BONDED SILICON CARBIDE CRUCIBLES

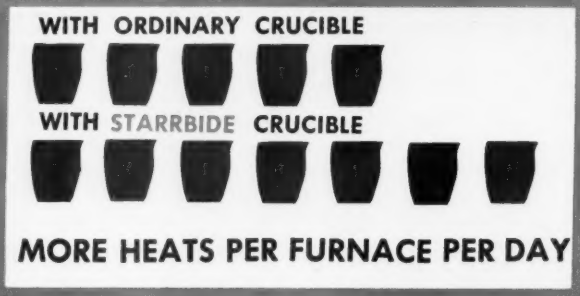
STARRBIDE produces more metal per furnace per day because furnace linings need not be changed to accommodate a larger melt than the conventional crucible would handle.



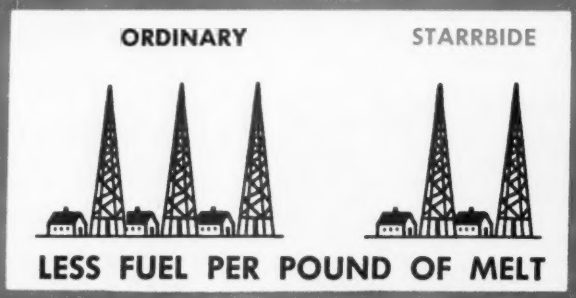
STARRBIDE provides more metal per heat because its new, scientific wall design increases the amount of metal a given size of crucible will hold.



STARRBIDE provides more heats per furnace per day because the wall design affords a faster heat exchange.

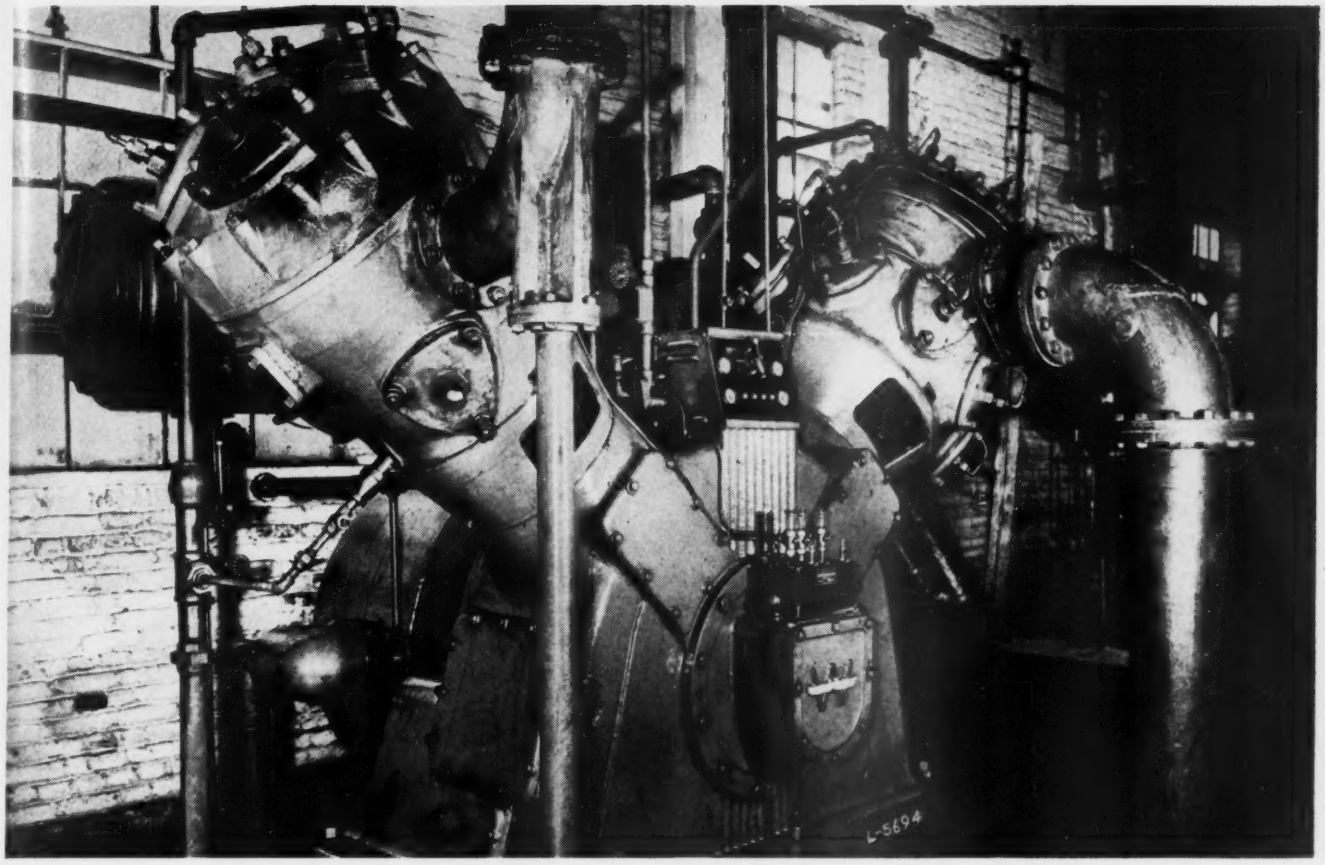


STARRBIDE decreases the cost of fuel per pound of melt since the source of heat is closer to the metal.



STARRBIDE crucibles are lighter, easier to handle. They will suffer less from damage in transporting to and from storage.

AMERICAN CRUCIBLE COMPANY
NORTH HAVEN • CONNECTICUT • U. S. A.



Lynchburg Likes Worthington Air

As you probably know, Lynchburg Foundry Co. in Lynchburg, Virginia has one of the most modern plants in the country.

They use compressed air to power much of their work. With compressed air, they get *dependable* power and lower costs of operation and maintenance.

And with their *Worthington* Air Compressors, they get lowest-cost compressed air and longest compressor life.

*Reg. U. S. Pat. Off.

Lowest-Cost to Install and Operate

A Worthington DC-2 was installed in 1945—a horizontal duplex direct-connected compressor with Worthington's famous Feather* Valve (lightest, tightest, most efficient ever made) . . . automatic variable capacity control, the most simple, accurate and flexible control available . . . and a high-efficiency intercooler that needs less water, power, attention.

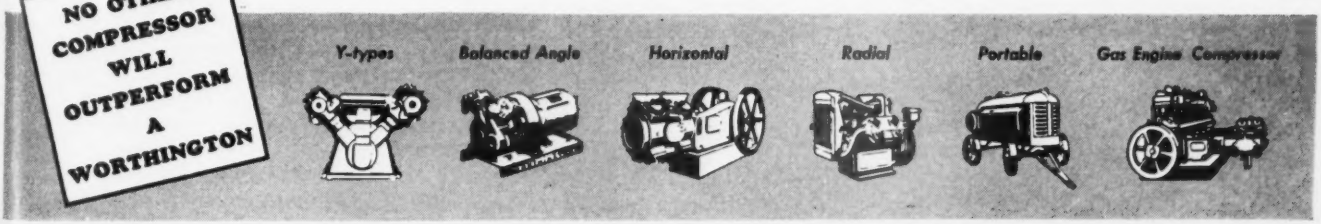
In 1948, a Worthington YC-2 was added. This unit comes *pre-assembled*—no alignment problem, no erecting engineer needed. Its economical operation comes from its balanced Y-frame (for higher rpm), Feather* Valve and 3- and 5-step variable capacity control.

So take a tip from Lynchburg and get to know why *there's more worth in Worthington.* Write for Air Compressor bulletins to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo 5, New York.

WORTHINGTON

K.1.5

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON



300%

THE BULLARD COMPANY

MANUFACTURERS OF MACHINE TOOLS
FOUNDED 1880

CABLE ADDRESS "BULLARD" BRIDGEPORT, CONN.

BULLARD

TELEPHONE BRIDGEPORT 6-2011

BRIDGEPORT 2, CONN., U. S. A.

SUBJECT

MAY 12, 1951.

MR. BRUCE L. SIMPSON, PRESIDENT,
NATIONAL ENGINEERING CO.,
549 WEST WASHINGTON BOULEVARD,
CHICAGO, ILL.

DEAR MR. SIMPSON:

THE SAND HANDLING AND PREPARING SYSTEM THAT YOUR COMPANY ENGINEERED FOR OUR DRY SAND FLOOR HAS BEEN IN OPERATION FOR NINE MONTHS.

WE FEEL THAT [illegible] HAS PROVEN ITSELF, IN THIS SHORT PERIOD, TO BE [illegible] SAVING AND SPACE [illegible] LAYOUT.

WE HAVE BEEN SIMPSON MULLING OUR SANDS SINCE 1918, AND HAVE BEEN FULLY AWARE OF THE ADVANTAGES OF [illegible] MULLING PRINCIPLE, YET THE MODERN [illegible] MULLING EQUIPMENT IN OUR NEW SYSTEM HAS [illegible] QUALITY OF OUR FINISHED PRODUCT, THROUGH IMPROVING OUR SANDS AND SIMPLIFYING OUR SAND CONTROL.

SINCE THE SAND SYSTEM HAS BEEN INSTALLED, OUR PRODUCTION DEMANDS HAVE INCREASED 300%, BUT, THROUGH IMPROVED OPERATIONS, THE MANPOWER IN THE SAND-HA[illegible] CASTING CLEANING DEPARTMENTS HAS INCREASED ONLY 100%. THIS FACT, IN THE PRESENT TIGHT LABOR MARKET, HAS ENABLED US TO INCREASE OUR PRODUCTION MORE RAPIDLY THAN WOULD HAVE BEEN POSSIBLE HAD WE NOT REPLACED OUR OLD SYSTEM WITH THE NATIONAL ENGINEERED LAYOUT.

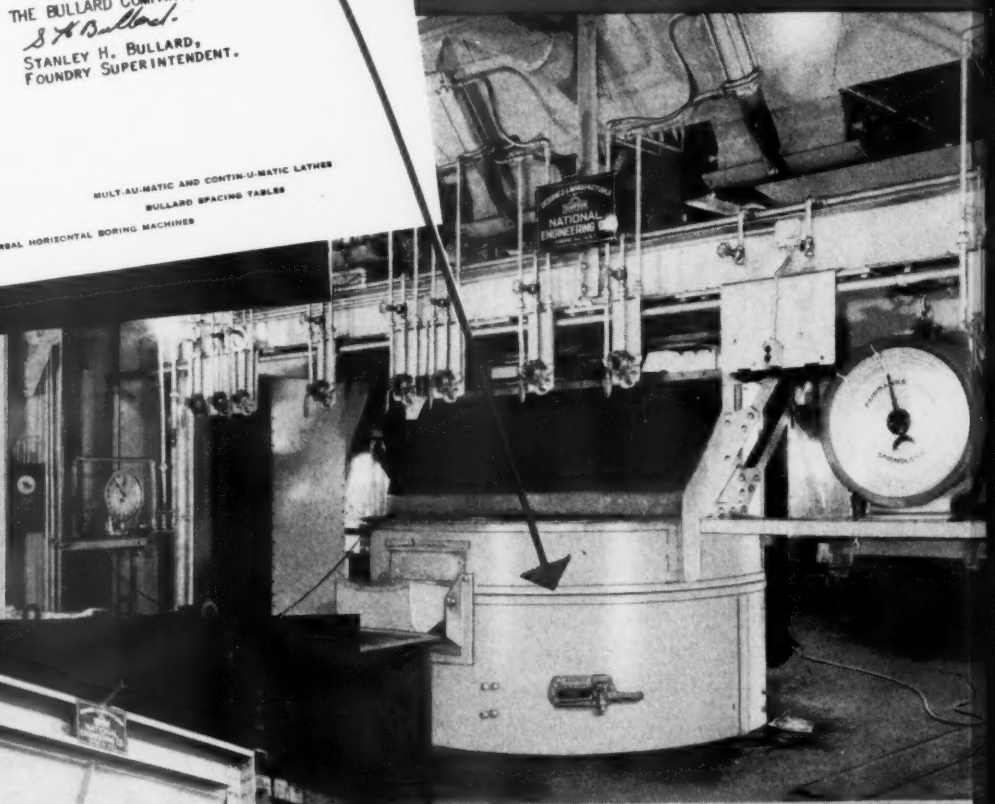
WE ARE QUITE PROUD OF THE SAND SYSTEM, SO PLEASE FEEL FREE TO USE OUR FOUNDRY AS A "SHOW-ROOM" FOR YOUR PRODUCTS.

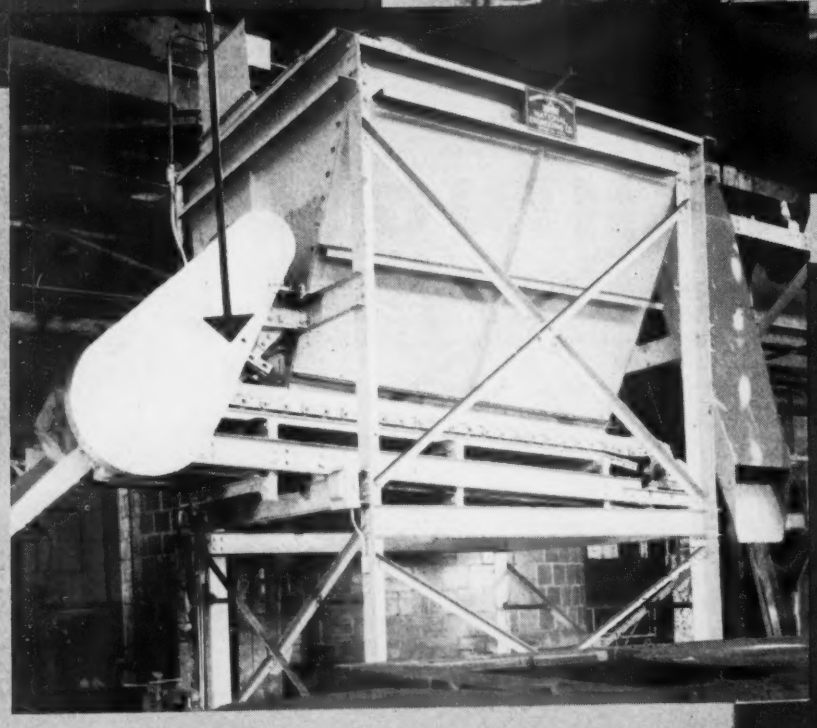
VERY TRULY YOURS,

THE BULLARD COMPANY,
S. H. Bullard
STANLEY H. BULLARD,
FOUNDRY SUPERINTENDENT.

SHB/F

CUT-MASTER AND MAN-AU-TROL V.T.L.'S
MAN-AU-TROL HORIZONTAL LATHES
MULT-AU-MATIC AND CONTIN-U-MATIC LATHES
BULLARD SPACING TABLES
BULLARD UNIVERSAL HORIZONTAL BORING MACHINES





ABOVE: No. 3 Simpson **Mulsifier** fed from overhead storage bins by traveling weigh larry (note National Cycle Timer at extreme left)—installed at Bullard foundry, Bridgeport, Conn.

• • •

LEFT: 8 ft. x 10 ft. sand hopper feeding 30 in. apron conveyor, delivering prepared sand to roll-over machines . . . part of the National-Engineered layout at the Bullard Company foundry.

INCREASE

IN PRODUCTION DEMAND

BULLARD COMPANY solves big production boost with SIMPSON *Intensive* Mullers and NATIONAL-Engineered Sand System

MR. BULLARD'S letter, reproduced at the left, is a strong, factual testimonial covering the merits of SIMPSON-Mulled sand, together with the ability of NATIONAL-Engineered equipment to meet the tremendous demands of a 300 percent increase in foundry production in just nine months.

Here is further proof that Simpson Intensive Mullers and National Sand Handling Systems are designed to stand the gaff of rapidly expanding production . . . yet with no compromise with the quality so necessary to produce high grade castings.

As Mr. Bullard says—their rapid production increase would have been impossible had they not replaced their old system with the National-Engineered layout.

Why not let National Engineers help solve your tough production problems? Our complete engineering service, plus the well-known advantages of Simpson Intensive Mullers, can increase your production . . . improve the quality of your castings . . . reduce scrap . . . and effect over-all economies in time and labor.

Write today for Bulletin R 120.

SIMPSON *Intensive* MULLERS

NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents for Continental European Countries—Georges Pinkert, Ltd., Schaffhausen, Switzerland; for British Possessions—Angus's Limited, Halifax, England; for Canada—Canadian Engineering Co., Ltd., Montreal; for Australia and New Zealand—Gibson, Battle & Co., Pty. Ltd., Sydney; for Argentina, Brazil and Uruguay—Sudamericana Industrial (SIA) Ltda., Sao Paulo, Brazil; for Mexico—CARLOS E. De A.L., Mexico, D.F.

more and more foundries agree:*

for a **permanent solution**

to foundry problems

use the **temporary services**

of Knight engineers

for plant layout
architectural planning
methods
modernization
mechanization
materials handling
management
organization
production and cost control
job evaluation and wage incentives
foreman and operator training

No matter what the problem or problems may be that limit your production or prevent an adequate profit margin, Knight professional foundry engineers can be of unusual help. Knight Engineers are particularly qualified to offer valuable assistance because of their many years' successful experience in foundry management, production, engineering or equipment and their knowledge of the operations of all types and sizes of foundries—gray iron, magnesium, aluminum, brass, bronze, malleable or steel—producing castings from a few ounces to 30 tons.

By adding Knight Engineers to your staff temporarily, you can utilize the time, ability and experience of these professional men for the best possible solution of your problems.

You may need a complete new foundry or modernization of only one department, new methods or layout, facilities or procedures, foreman or operator training, cost or production controls, job evaluation or wage incentives, organization or mechanization, architectural planning or temporary management.

This comprehensive engineering service is available to you by advising your requirements at either our New York or Chicago office.

* A list of foundry projects engineered by Knight is available upon request.

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Increase Customer Satisfaction

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- **ALUMINUM ALLOYS** — *for all types of castings*
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- **ALUMINUM BASE HARDENERS** — *for alloying and grain refining purposes*
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- **ALUMINUM FLUXES** — *for cleansing and grain refining all alloys*
- **MAGNESIUM ALLOYS** — *for all types of castings*
- **MAGNESIUM ANODES** — *for cathodic protection*
- **ZINC ALLOYS** — *for die castings and metal forming dies*

In the Apex laboratories, Apex research and facilities are devoted to producing *better* ingot, analyzing particular problems for foundries who use *all* methods of castings—sand, permanent mold or die casting. Thus, Apex maintains always this high standard: "Best in every test from Ingot to Casting!"

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Spectrographic standards . . . Chemical analytical methods . . . Physical and mechanical property tests . . . Chemical, quantometer and spectrographic analyses . . . Field engineering.

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Sand at your fingertips — mass production at its best. Production at a profit, too, with Jeffrey high-speed molding stations, mold conveyors, flask fillers, sand handling and conditioning equipment on the job. Single units or complete systems — give us a chance to make recommendations.

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Complete Line of Material Handling, Processing and Mining Equipment

You can cut down discards with

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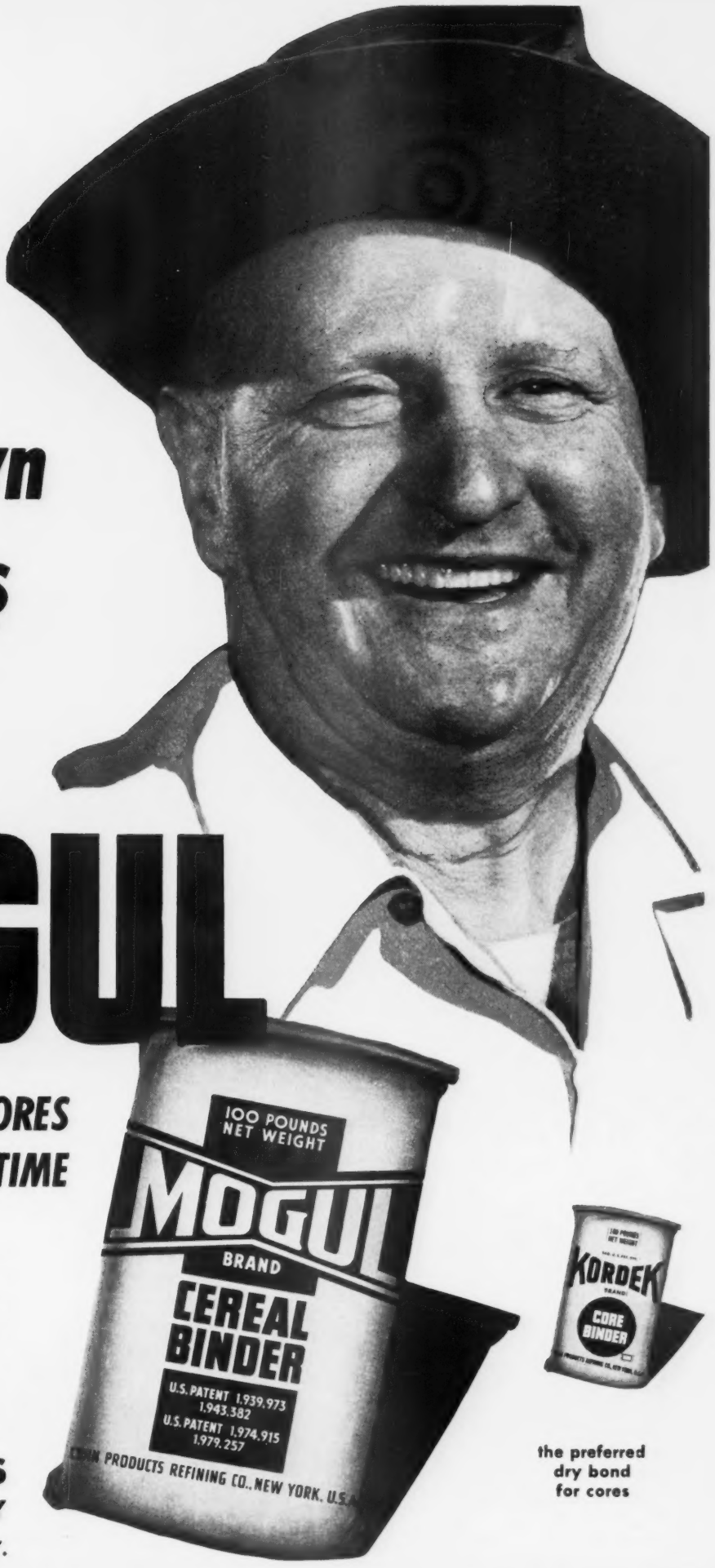

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CUTS DRYING TIME

Full technical service, without obligation, is available to show how you can profit from the use of MOGUL® Cereal Binder in your production.

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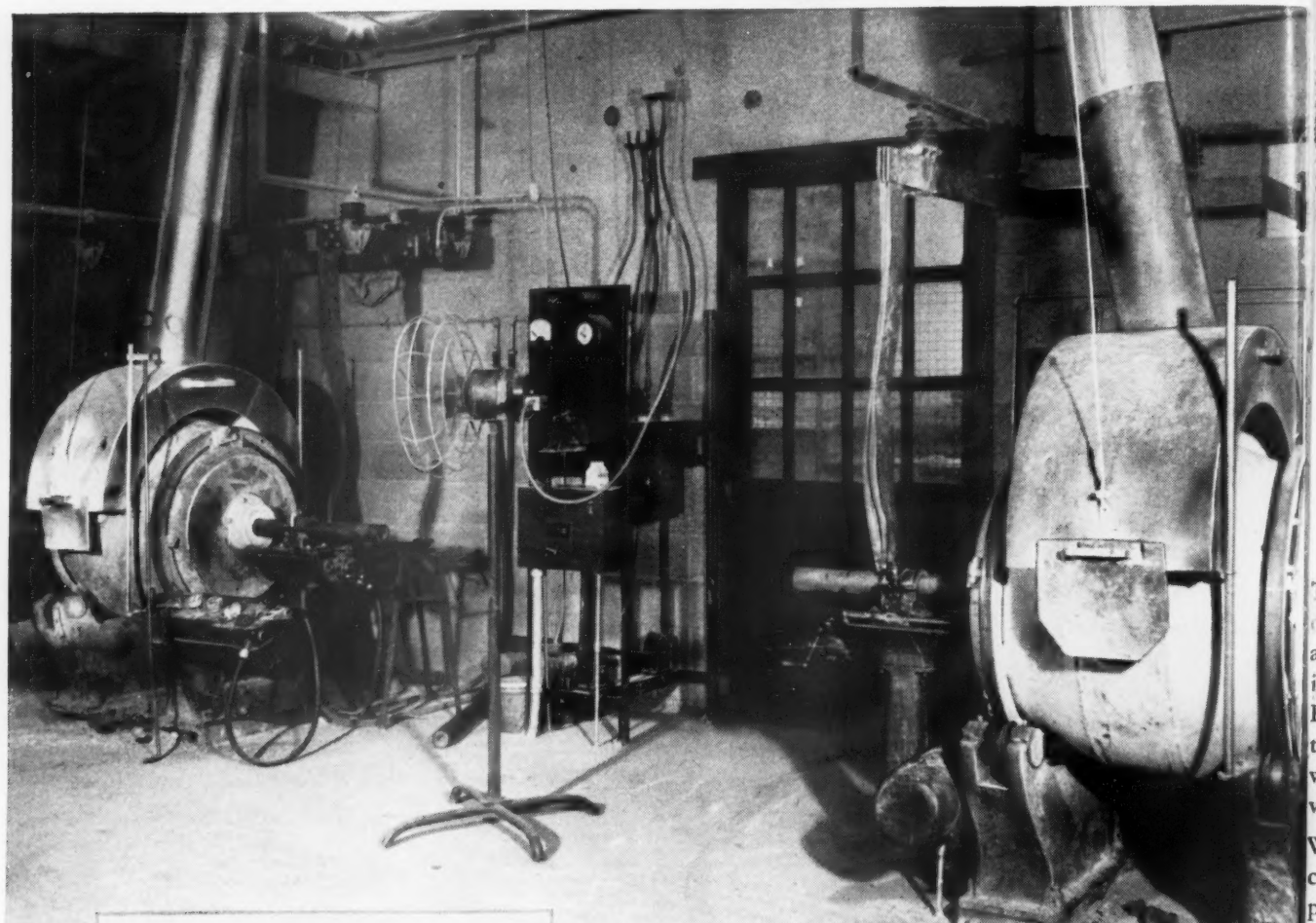
17 Battery Place • New York 4, N. Y.

the preferred dry bond for cores

Better Castings and a



▲ *Two 350 lb. Type LFC Detroit Rocking Electric Furnaces melt all brass used at Ford Meter Box Company, Wabash, Indiana. Note ventilating hoods, clean installation.*

◀ *Ford valves and couplings are shown in panel at left. These brass articles are typical of the many cast from DEF metal at Ford Meter Box Company.*

◀ *The double-lid water meter boxes, left, are one of the types of installations made by Ford for municipalities from coast to coast. This is for outdoor use.*

ooler, Cleaner Foundry

DETROIT ROCKING ELECTRIC FURNACES

are the answer at this progressive Midwest company

To beat corrosion, Ford Meter Box Company uses a lot of brass in the manufacture of settings, valves, couplings and adapters for water meter boxes. All this red brass is melted efficiently and economically in two Detroit Electric Furnaces, and castings are made in an exceptionally clean, comfortable foundry department, in which furnaces and casting operations are completely ventilated.

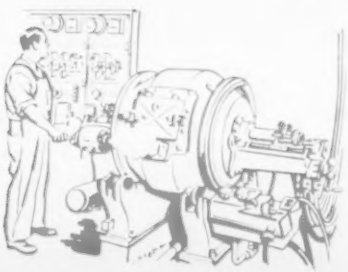
With Detroit furnaces, melt analysis is controlled to very close variations, with metal of the desired characteristics produced by each heat. Accurate temperature control, too, follows the pattern of fastest, most efficient operation. The rocking action of Detroit furnaces assures homogenous melts, and—because of the washing action of the molten metal over the lining—a more complete utilization of generated heat.

Detroit Rocking Electric Furnace advantages are many and important: Positive control of composition and quality, less metal shrinkage, more efficient use of power, more heats per day, less out-of-production time because of easy shell replacement.

Furnaces have capacities from 10 to 4000 lbs., individually designed for your electrical specifications.

Want high operating economy, high quality melts and castings? Get full information on Detroit Rocking Electric Furnaces. Write today!

Faster melts, better melts

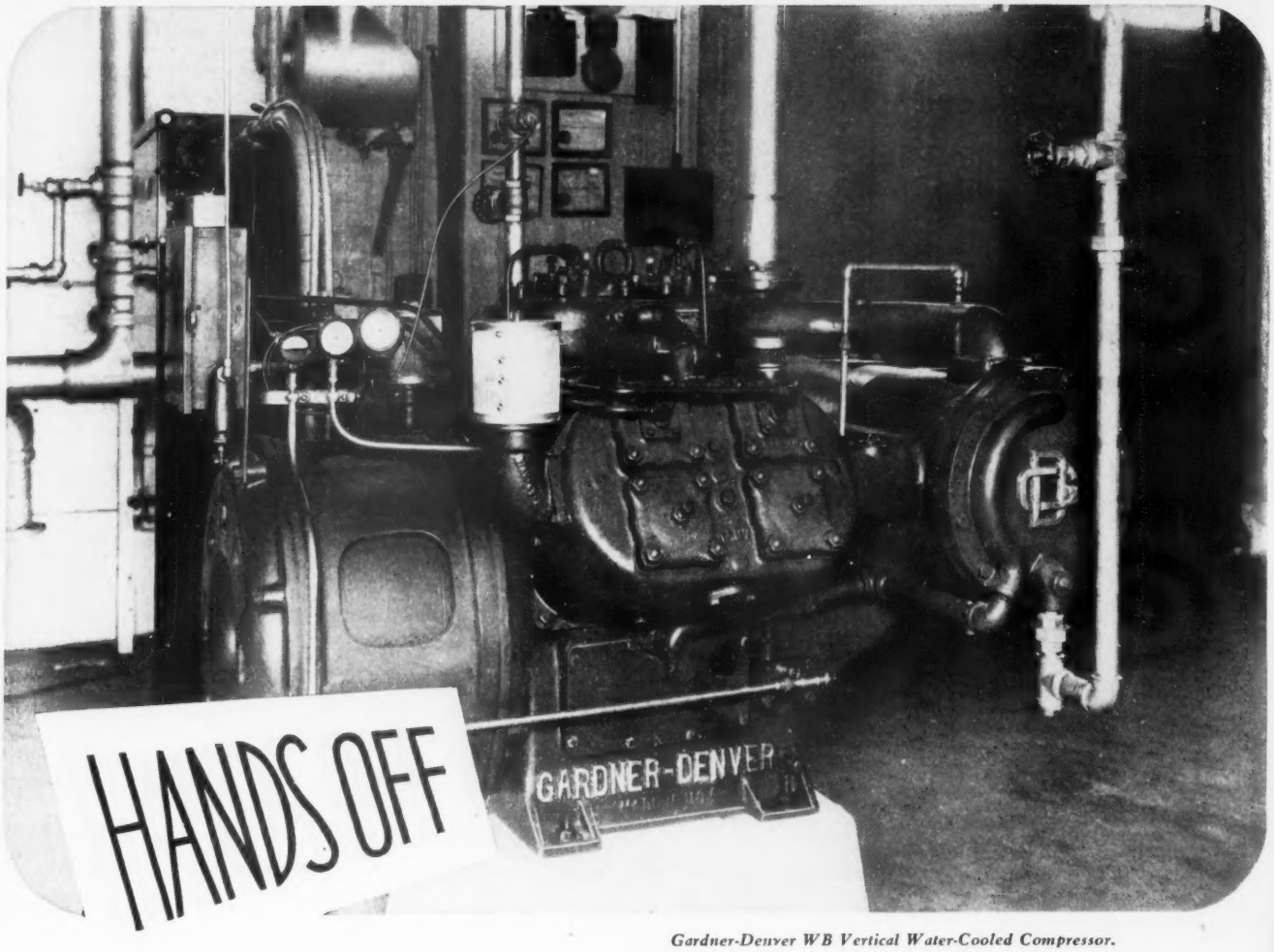


ROCKING ACTION DOES IT!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Eisa" Ltd., Sao Paulo, CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y., MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F.



Gardner-Denver WB Vertical Water-Cooled Compressor.

"That sign's been up seven years already!"

A Gardner-Denver WB Compressor like this was installed in a midwestern plant seven years ago. It has never been touched since—except to change the oil and take up on the water pump packing. The valves have never been examined—even though the compressor saw 24-hour service much of the time.

Your maintenance men can keep "hands off," too, when you choose a Gardner-Denver WB Air Compressor. And a WB saves space as well as maintenance dollars—gives you big air capacity and high efficiency from a small corner of your plant.

Gardner-Denver WB Compressors are available with water tube intercooler, as shown, or with self-contained radiator intercooler for use where good cooling water is scarce. Send today for bulletin WB-10.

SINCE 1859

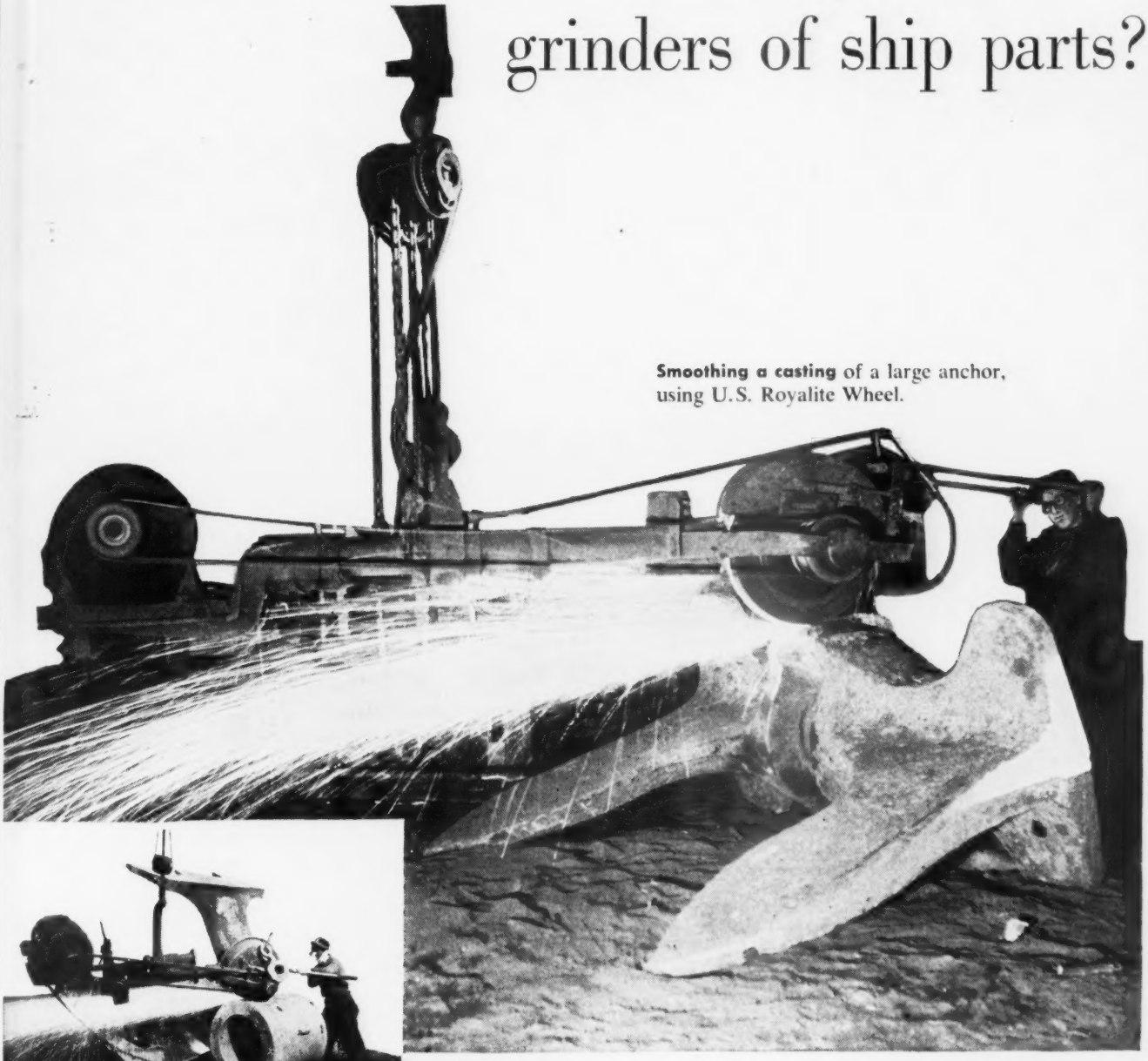
GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN PUMPS, COMPRESSORS AND ROCK DRILLS

What's U.S. Rubber doing for the grinders of ship parts?



Smoothing a casting of a large anchor, using U.S. Royalite Wheel.

Here a U.S. Royalite® Wheel is being used on intermediate strut for a ship's propeller shaft. In this particular steel foundry, "U.S." Wheels have been used for over 16 years.

By developing grinding wheels which are specifically designed for the job, United States Rubber Company engineers are helping reduce costs and finishing time. Whatever your grinding wheel problem may be—there is a U.S. Grinding Wheel to handle it. For complete information, write to address below.

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OTHER TYPES OF
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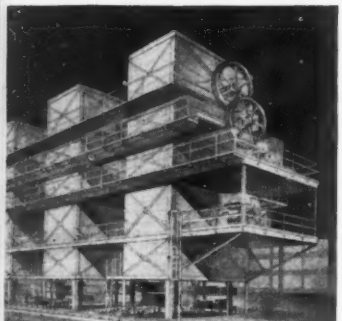
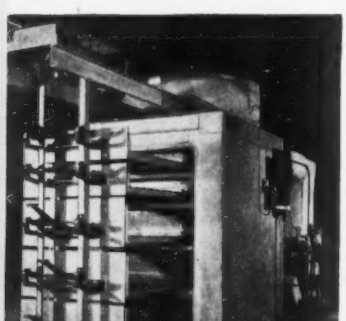
ENGINEERING that's geared for faster and more efficient production, lower cost.



VERTICAL CORE OVENS
at General Steel Castings Co.



ROLLING DRAWER CORE OVEN
at Aluminum Co. of America

ASK CONCERNS LIKE THESE. Many of them have chosen Carl-Mayer Oven Equipment repeatedly.

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American Brake Shoe Co.
American Radiator Co.
Blaw-Knox Co.
Brown Industries
Buick Motor Div. of General Motors Corp.
Bucyrus-Erie Co.
Cadillac Motor Div. of General Motors Corp.
Columbia Steel Corp. (U. S. Steel Corp.)
Crucible Steel Castings Co.
Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
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Golden Foundry Co., Inc.
Henry Kaiser Corp.
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Mesta Machine Co.
F. E. Meyers & Bro. Co.
Oil Well Supply Co. (U. S. Steel Corp.)
Packard Motor Car Co.
H. B. Salter Co.
Shenango Penn Mold Co.
Standard Foundry Co.
Union Brass & Metal Mfg. Co.
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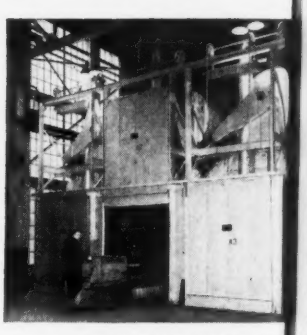
A. C. Williams Co.
Whiten Machine Works
Whiting Corp.

HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co.



RACK TYPE CORE OVE
at Aluminum Co. of Am

CAR TYPE MOLD OVE
at Oil Well Supply C

THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

BACKED BY REPUTATION AND OVER 30 YEARS' EXPERIENCE

The right spot for a PAYLOADER

What is the right spot for a PAYLOADER? It's any place inside your buildings or in the yard where bulk materials are being handled by laborious or other obsolete methods. Thousands of these special tractor-shovels are in "right spots" *today* cutting costs, solving manpower shortages and increasing output.

PAYLOADERS are able to pay for themselves in a few months because they are designed for the specific job of handling bulk materials of all kinds — loading, unloading, scooping, lifting, carrying, dumping and spreading. Outstanding reasons for the performance and acceptance of PAYLOADERS include: short, compact, space-saving design; multiple reverse speeds; large pneumatic tires that permit operation indoors and outdoors . . . on paved or unpaved areas; simple, easy operation; complete hydraulic bucket control.

The 12 cu. ft. model HA shown is an outstanding box car unloader. It is the smallest of six PAYLOADER sizes which range up to 1½ cu. yd. bucket capacity. Every PAYLOADER is backed by 30 years of manufacturing experience and by a world-wide Distributor service organization. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

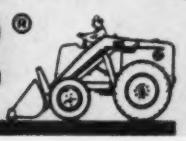
- Unload box cars.
- Carry sand, coke, scrap limestone, etc., to storage.
- Transport and distribute sand to molding stations.
- Remove used sand from floors.
- Windrow sand for the cutter.
- Charge mullers, tumbling barrels.
- Feed conveyors, elevators, hoppers, mixers.
- Clean up gangways, aisles and other areas.
- Handle scrap, small castings, slag.
- Lift-haul-push-pull.

Write for literature on PAYLOADERS and the name of your Hough Distributor. He'll be glad to help you find the "right spot" for the right size of PAYLOADER in your operations. No obligation.

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. · *Since 1920*

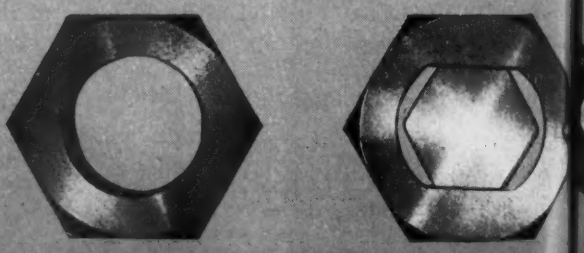


FIRST thirty years ago

...when HINES designed and produced the original hard-chrome-plated and ground pins, and hardened, hard-chrome-plated and ground bushings

and still FIRST today

...for the finest, most efficient and economical flask and pattern plate PINS and BUSHINGS.



THE HINES

3431 WEST 140th STREET

HINES

PINS and BUSHINGS

Write for sizes and prices

INSTALLATION TOOLS

The counterboring tool and wrench are the only tools needed for an installation of HINES Pins and Bushings

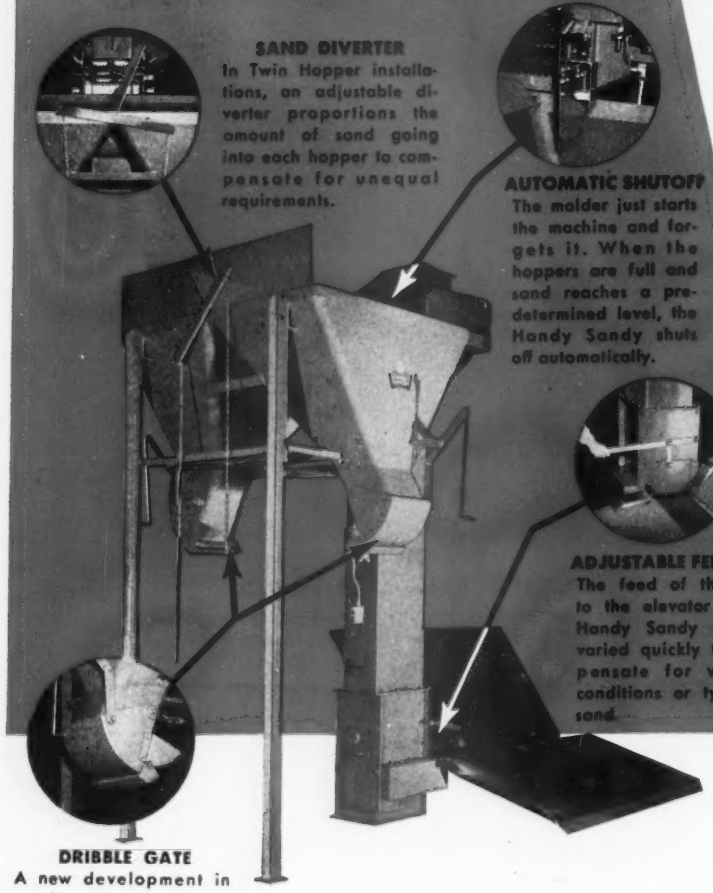
SFLASK CO.

CLEVELAND 11. OHIO

the HANDY SANDY® gives you 7 Advantages that mean Lower Cost sand handling for you

Fits any size Foundry

Improved features that make the HANDY SANDY even more automatic



SAND DIVERTER
In Twin Hopper installations, an adjustable diverter proportions the amount of sand going into each hopper to compensate for unequal requirements.

AUTOMATIC SHUTOFF
The molder just starts the machine and forgets it. When the hoppers are full and sand reaches a predetermined level, the Handy Sandy shuts off automatically.

ADJUSTABLE FEED GATE
The feed of the sand to the elevator of the Handy Sandy can be varied quickly to compensate for varying conditions or types of sand.

DRIBBLE GATE
A new development in overhead hopper gates that eliminates any particles of sand from dropping into prepared mold.

1. PUTS THE SAND PILE OVERHEAD. The Handy Sandy raises the sand overhead where it is available to the molder without effort. He just pulls the release and the sand falls into the flask.

2. ELIMINATES SHOVELING AND WASTE MOTIONS FOR THE MOLDER. With a Handy Sandy there are no waste motions that tire the molder and reduce his efficiency. His rate of output remains the same from morning until night. He spends more time making molds and less time getting ready.

3. INCREASES MOLDERS' OUTPUT. The Handy Sandy removes the shovel from the molder's hand and lets him devote full time to molding. As a result, users have found the output of their molders is increased from 30% to 70%.

4. SAVINGS FROM THE FIRST UNIT PAY FOR THE NEXT. You don't have to make a major investment for the Handy Sandy. You can equip one floor at a time — the savings from one unit will help pay for additional units.

5. IMPROVES CONDITION OF SAND. A built-in aerator in the Handy Sandy gives the sand added blending, breaks up lumps, and improves the texture. Hand riddling can often be eliminated.

6. TAKES LITTLE SPACE. The Handy Sandy occupies no more floor space than the sand pile itself. It can be installed in most any foundry where space is limited. As it requires little headroom, no structural changes are required.

7. LOW COST — SIMPLE TO INSTALL. The Handy Sandy is a compact, packaged unit that can be installed in a few hours time. **It requires no expensive overhead conveyors, no pits or foundations.** Its simplified design means low initial and operating costs and dependable performance. It's factory wired.

WRITE FOR BULLETIN NO. 205

PROMPT DELIVERY GUARANTEED ON ALL STANDARD UNITS

NEWAYGO | ENGINEERING COMPANY

NEWAYGO, MICHIGAN

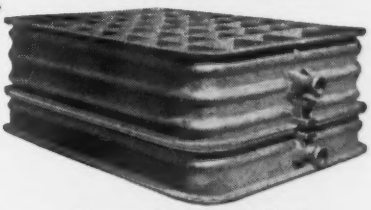
Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

TRUSCON
MARK OF MERIT
PRODUCTS

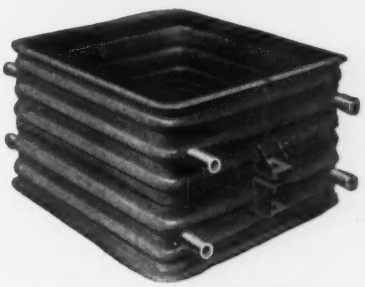
TRUSCON STEEL FOUNDRY FLASKS

Chase Father Time...

Truscon OM-1 One-Man Flask



Truscon CH-40 Crane Flask



Truscon TM-10 Two-Man Flask

with Truscon Steel Flask strength

The walls of every Truscon flask are built with great strength and rigidity to withstand severe strains. The ribs and flanges extend full depth around the entire flask without buckling or cutting away the metal. • The flanges and ribs of Truscon flasks are designed to help the molder. The flange on the filling side is turned out so it won't interfere with filling or shaking out. The flange on the bottom side or parting line is turned in, forming a sand strip to carry the sand. • Truscon flasks have available a range of handles and pin lugs to meet every particular need. *They are welded securely to withstand heavy strains.* • Every Truscon cope, drag and check is one integral piece of steel. Truscon flasks withstand the knocks and hard usage they are bound to get. • Write for catalog showing the wide range of Truscon Steel Flasks that can be manufactured.

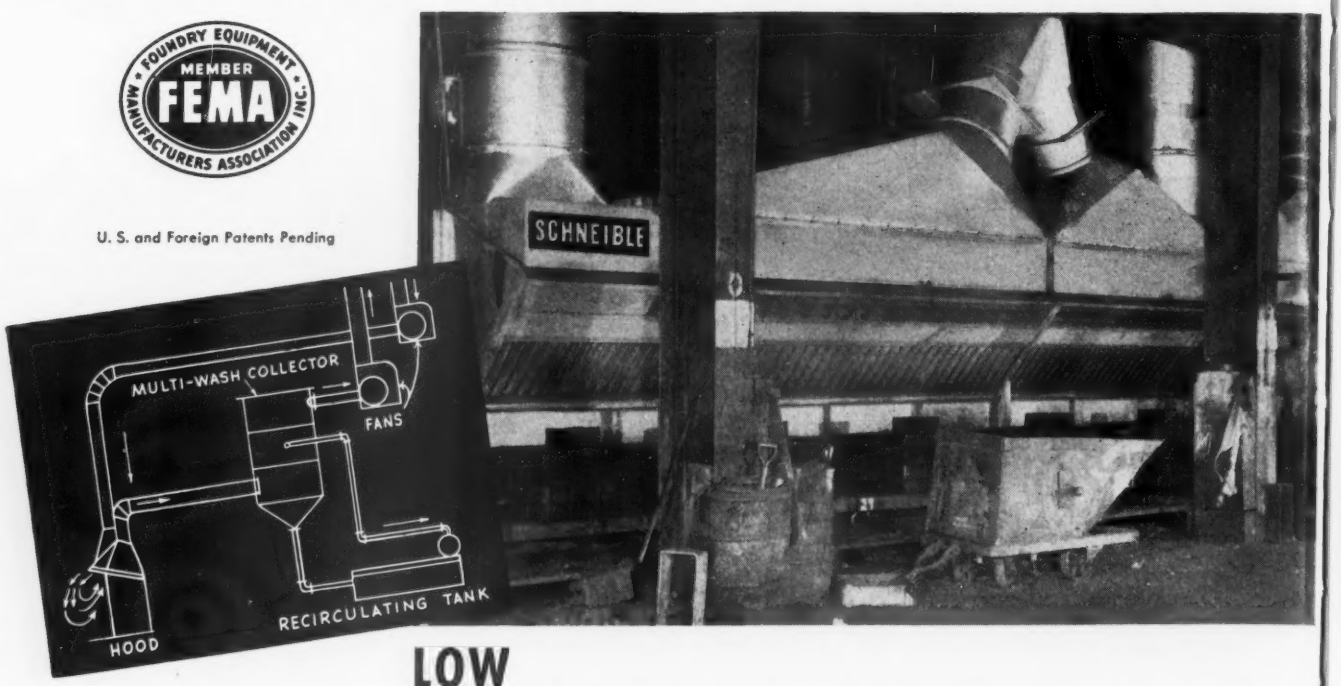
TRUSCON STEEL COMPANY

PRESSED STEEL DIVISION
6202 Truscon Avenue, Cleveland 4, Ohio
Subsidiary of Republic Steel Corporation

STEP UP NEXT WINTER'S EFFICIENCY...
Install "Compensating Air" Hoods *Now*—

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

U. S. and Foreign Patents Pending



Schematic drawing showing layout of system for compensating air unit.

LOWER Ventilating and Heating Costs *Too!*

To LOWER your foundry ventilating and heating costs and improve working conditions at the same time, put the Schneible "Compensating Air" principle to work for you.

If the weather's hot, air supply is taken from high inside the foundry, in severe weather outside air is used . . . in both cases the result is efficient control of air to suit climatic variations. Heat is dissipated in summer and conserved in winter, thus creating comfortable work station temperatures the year 'round with no loss of valuable warm air when most needed.

Be sure to consult us when considering more efficient dust and fume control measures.

Free

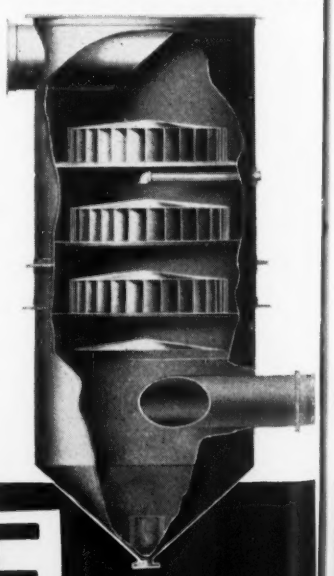
Write for our bulletin number 450 containing complete Uni-Flo Hood information.

CLAUDE B. SCHNEIBLE COMPANY
P. O. Box 502, Roosevelt Annex, Detroit 32, Michigan

MULTI-Wash COLLECTORS

Model HC—1500 to 36,000 c.f.m. or multiple units for larger capacities.

Model JC—1000 to 36,000 c.f.m. or in multiple units, if greater capacity desired.



SCHNEIBLE

Late Foundry News

JULY 26, 1951

ADVISORY COMMITTEE MEETS: Malleable Iron Castings Industry Advisory Committee to the NPA met in Washington July 19, with A. J. McDonald, chief, Iron and Steel Castings Section, presiding. Committee outlined importance of malleable iron in defense and defense supporting activities; stressed need for a constant flow of business to maintain supply of manpower; complained of the continued failure of NPA to conduct a survey of the supply of nearly 100 different items regularly used by malleable foundries, including pig iron, scrap, binders, sand, chaplets, nails, facing, etc., so that industry will know requirements for these items; wondered if NPA applies controls just for the sake of controls and advocated cutting down instead of expanding controls; questioned if the ferrous casting industry as a whole is getting its historical 12 per cent of the pig iron supply; asked if the foundry industry is getting its fair share of scrap supply; recommended government action to stimulate flow of foreign scrap into the country; and requested accurate information on what was expected of the industry in defense mobilization. Committee members attending were: Robert J. LaMarch, American Malleable Castings Co., Marion, O.; James H. Smith, General Motors Corp., Saginaw, Mich.; L. J. Wise, Chicago Malleable Castings Co., Chicago; G. J. Behrendt, Eastern Malleable Iron Co., Naugatuck Malleable Division, Naugatuck, Conn.; P. H. Vincent, Erie Malleable Iron Co., Erie, Pa.; Cal C. Chambers, Texas Foundries Inc., Lufkin, Tex.; C. A. Gutenkunst Milwaukee Malleable & Grey Iron Works, Inc., Milwaukee; Frank D. Brisse, Laconia Malleable Iron Co., Laconia, N. H.; W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland; G. T. Boli, Northern Malleable Iron Corp., St. Paul; R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.

NICKEL SUPPLY UP: Refined nickel output by International Nickel Co. has been boosted a million pounds monthly, an increase previously not expected to be realized until the year-end. Production now is 21 million pounds monthly, but there is no early prospect of supply catching up with potential demand.

HOW MUCH FOR DEFENSE?: Only a relatively small part of industrial output currently is for the Department of Defense, but it will continue to grow. A good picture of the military's share of total production is given by the NPA breakdown of where the estimated 20.8 million tons of steel products to be made this quarter will go. It shows only 8.5 per cent of this tonnage going for direct military purposes. So-called defense-supporting requirements amount to 75 per cent; this includes a lot of uses commonly considered as ordinary civilian needs, such as industrial machinery, farm implements, freight cars, road work, etc. Automobiles and other consumer durables in the "free area" steel classification will take 16.5 per cent of all steel. This breakdown probably will approximate that in castings distribution also.

ELECTRODES: Allocation of graphite and carbon electrodes, originally scheduled to start July 1, has been delayed until Aug. 1 because of the amount of paper work involved.

ALUMINUM PRICE CUT: OPS has rolled back prices of aluminum scrap and secondary ingot 30 to 50 per cent below previous ceiling levels. The new ceilings (covered by CPR 54) correct a situation occasioned by the January general freeze whereby secondary ingots were selling substantially above the primary aluminum price of about 20 cents a pound. The regulation is intended to set scrap and secondary ingot prices at levels reflecting the value of metallic content in terms of current prices for primary aluminum.

COPPER SCRAP CEILINGS: Maximum prices for copper scrap, copper alloy scrap and brass mill scrap also have been rolled back to levels generally restoring pre-Korean differentials below new metal prices. CPR 46 covers the copper and copper alloy grades, CPR 47 brass mill scrap.

INGOT ALLOCATION: Starting in August copper-base alloy ingot will be under allocation, and smelters will not be permitted to ship to foundries unless orders are properly certified and show an allocation number.

HEADS DIVISION: H. L. Tigges, formerly head of the NPA General Industrial Equipment Division, has been appointed director of the newly formed NPA Metal Working Equipment Division, which will include the Foundry Equipment and Supplies Section.

FOUNDRY CONSTRUCTION: Certificates of necessity issued recently by the government for accelerated tax amortization apply to new facilities for these foundries: Crawford Steel Foundry Co., Bucyrus, O., $22,016; Gold Foundry & Machine Works, Independence, Mo., $20,634; Crucible Steel Co. of America, Harrison, N. J., $802,333; Electric Steel Foundry, Portland, Oreg., $358,870; Baldwin-Lima-Hamilton Corp., Hamilton, O., $335,200; Blaw-Knox Co., Pittsburgh, $1,146,000; Youngstown Foundry & Machine Co., Youngstown, O., $233,687; Fulton Foundry & Machine Co., Cleveland, $89,900; Marion Malleable Iron Works, Marion, Ind., $360,205; Forest City Foundries Co., Cleveland, $479,691; Prospect Foundry Co., Minneapolis, $87,750; Fitchburg Foundry

Inc., Fitchburg, Mass., $86,800; American Steel Foundries, Verona, Pa., $381,000; American Steel Foundries, East Chicago, Ind., $58,100; Grabler Mfg. Co., Cleveland, $873,582; United States Pipe & Foundry Co., Decote, Alameda County, Calif., $2,750,360; Pratt & Letchworth Co., Buffalo, $280,500; Hitchiner Mfg. Co., Manchester, N. H., $112,516; Locomotive Finished Material Co., Atchison, Kans., $107,612; International Nickel Co., Bayonne, N. J., $64,951; Sacks-Barlow Foundries, Inc., Newark, N. J., $442,798; Fanner Mfg. Co., Cleveland, $963,250; Atlas Foundry & Machine Co., Tacoma, Wash., $428,000.

FERROSILICON: Silvery pig iron supplies will be cut an estimated 25 per cent shortly. A Jackson, O., blast furnace of one producer will shut down for repairs in August and a Buffalo stack of another interest is scheduled to close in September. However, the furnace industry expects to take care of increased production with present facilities, if necessary.

COPPER FOUNDRY BRANCH: Foundry Branch of NPA's Copper Division is starting to emerge from the blueprint to the organizational and functional stages. A number of men in the division have been charged tentatively with the responsibility for foundry and casting problems. No announcement as to personnel will be made until a branch chief has been formally appointed, and the latter organizes a staff. In the meantime, questions about copper and brass for use in producing castings should be addressed to Foundry Branch, Copper Division, Second Floor West, New GAO Building, Washington 25, D. C.

MISCELLANY: Ceiling prices on coke, scheduled to expire June 30, have been extended to Oct. 1 . . . . Mystic Iron Works, Boston, has been allowed a price increase by OPS of $3.50 a ton on pig iron . . . . Fairbanks, Morse & Co. is building a $7.5 million plant near Kansas City, Mo. It will include a foundry . . . . Wellman Bronze & Aluminum Co., Cleveland, is spending $500,000 to double its magnesium casting capacity . . . Birmingham brought 26 new industries into its district last year, has raised $600,000 for a five-year national promotional campaign to attract other industries, sales offices and warehouses . . . . Auburn Foundry Inc., Auburn, Ind., is rebuilding its plant which was almost completely destroyed in a $500,000 fire last January . . . . Col. R. K. Haskell has succeeded Col. S. R. Stribling as chief of the Chicago Ordnance District . . . National Metal Trades Association has postponed its annual convention to Nov. 19-20 at the Palmer House, Chicago . . . . Frank H. Hayes Jr., acting director of the NPA Copper Division since its organization, has been appointed director.

PRICES OF FOUNDRY METALS AND COKE (As of July 25, 1951)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	21.30
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis (Delivered)	25.40
Swedeland, Pa.	22.60
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	55.25	55.75
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa.	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOT

BRASS AND BRONZE: 85-5-5-5—29.00c; 88-10-2—44.50c; 80-10-10—35.00c; No. 1 yellow—25.50c.

ALUMINUM: 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 19.50c.

MAGNESIUM: 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered.

ZINC: High grade 18.85c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Heavy Melting Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$41.00	$41.50	$39.00
Buffalo	43.00	45.00	45.50	43.00
Chicago	42.50	44.50	45.00	42.50
Cincinnati	43.00	45.00	45.50	43.00
Cleveland	43.00	45.00	45.50	43.00
Detroit	41.15	43.15	43.65	41.15
Eastern Pa.	42.50	44.50	45.00	42.50
Los Angeles	35.00	37.00	37.50	35.00
Pittsburgh	44.00	46.00	46.50	44.00
San Francisco	35.00	37.00	37.50	35.00
St. Louis	41.00	43.00	43.50	41.00
Seattle	35.00	37.00	37.50	35.00

Above delivered prices are ceiling levels at basing points indicated. * Applies to dealer and industrial scrap; railroad heavy melting is $2 higher. ** Foundry steel 1 ft and under is $2 higher.

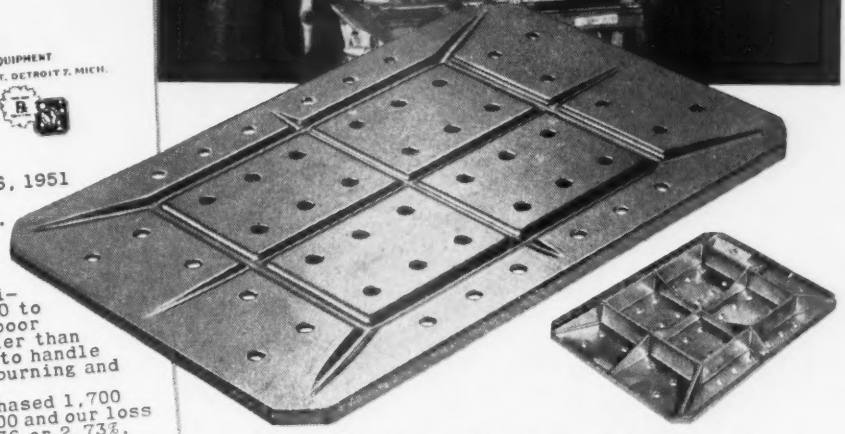
CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

"EDCO Dowmetal BOTTOM BOARDS have resulted in tremendous savings for our foundry"

... says M. C. Crawford of RILEY STOKER CORPORATION



Above photo shows molder at Riley Stoker Corporation placing EDCO Bottom Board on flask preparatory to pressing. EDCO DOWMETAL magnesium boards maintain high quality of castings and reduce rejects because the exclusive grooved and vented design permits escape of gasses and insures mold stability.

RILEY STOKER CORPORATION
FUEL BURNING AND STEAM GENERATING EQUIPMENT
101 WALKER STREET, DETROIT 7, MICH.

Christiansen Corporation
1515 North Kilpatrick Ave.
Chicago 51, Illinois

May 16, 1951

Attn: Mr. Edw. S. Christiansen, Pres.

Gentlemen:

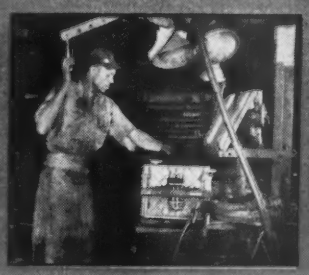
Before the purchase of EDCO Dowmetal Bottom Boards, we made our own wood boards at a cost of approximately 70c each. We would make 5,000 to 6,000 per year and ended up with a poor quality board. They were much heavier than EDCO magnesium boards, not as easy to handle on the line, and our losses due to burning and breakage were 60 to 80% per year.

In three years time, we have purchased 1,700 of your boards at a cost of $7,585.00 and our loss in this period has been only $207.36 or 2.73%.

EDCO Dowmetal Bottom Boards have resulted in tremendous savings for our foundry. It is a pleasure to recommend them to other foundries.

Yours very truly,
RILEY STOKER CORPORATION
M. C. Crawford
M. C. Crawford
Director of Purchases
Detroit Plant

Riley Stoker Corporation is one of the three largest manufacturers of steam generating and fuel burning equipment in the country. EDCO DOWMETAL Bottom Boards are used exclusively in their foundry in the production of gray iron and alloyed casting components.



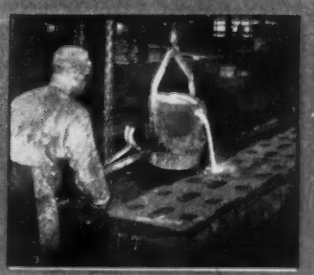


Photo at left shows molder pouring sand into flask. Photo at right shows molten metal being poured into molds which rest on EDCO Bottom Boards. Gravity conveyor line carries molds on for further processing.

Progressive foundry operators, like Riley Stoker Corporation, are equipping their foundries with EDCO DOWMETAL Bottom Boards.

Made of magnesium, these boards will not warp or break. There are no nails to come out, nothing to break or split—no upkeep! So durable, they can be considered permanent equipment. The many advantages from the use of these boards are effective immediately on their installation.

Write us or phone CApitol 7-2060 today for complete price schedule and list of 74 standard sizes available from stock.

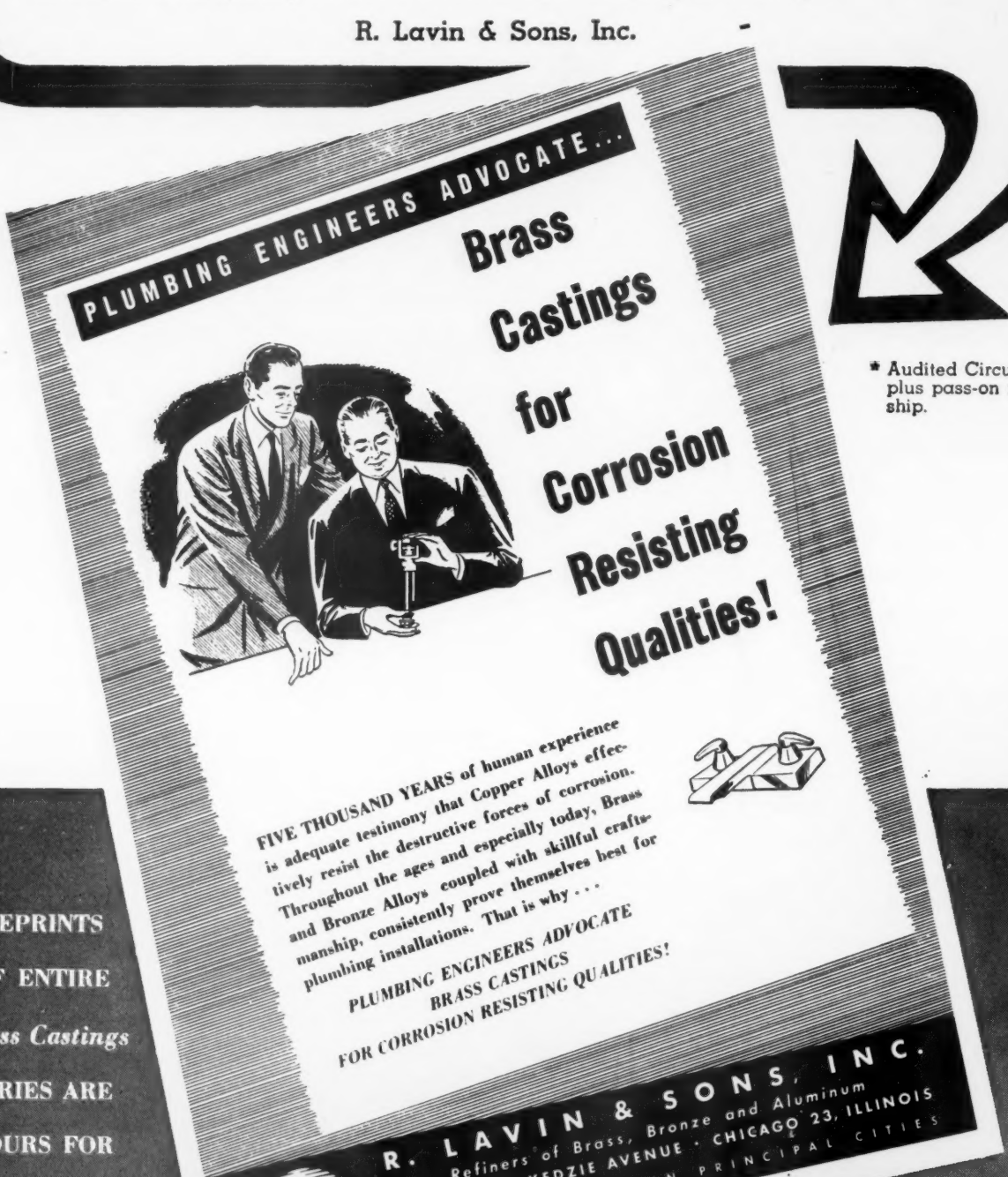
EDCO CHRISTIANSEN CORPORATION

CHRISTIANSEN CORPORATION
1517 N. KILPATRICK AVE. • CHICAGO 51, ILLINOIS
ALUMINUM ALLOY INGOTS • ZINC BASE DIE CASTING ALLOYS

THIS MONTH, 62,562* BUYERS OF CASTINGS WILL READ THIS AD...

This is one of a series of 6 full page ads emphasizing the expanding industrial acceptance of Brass Castings. Nationally circulated in outstanding trade journals and read by manufacturers, engineers, contractors, metallurgists, production control men—*these messages reach the men who specify and influence the purchasing of castings!*

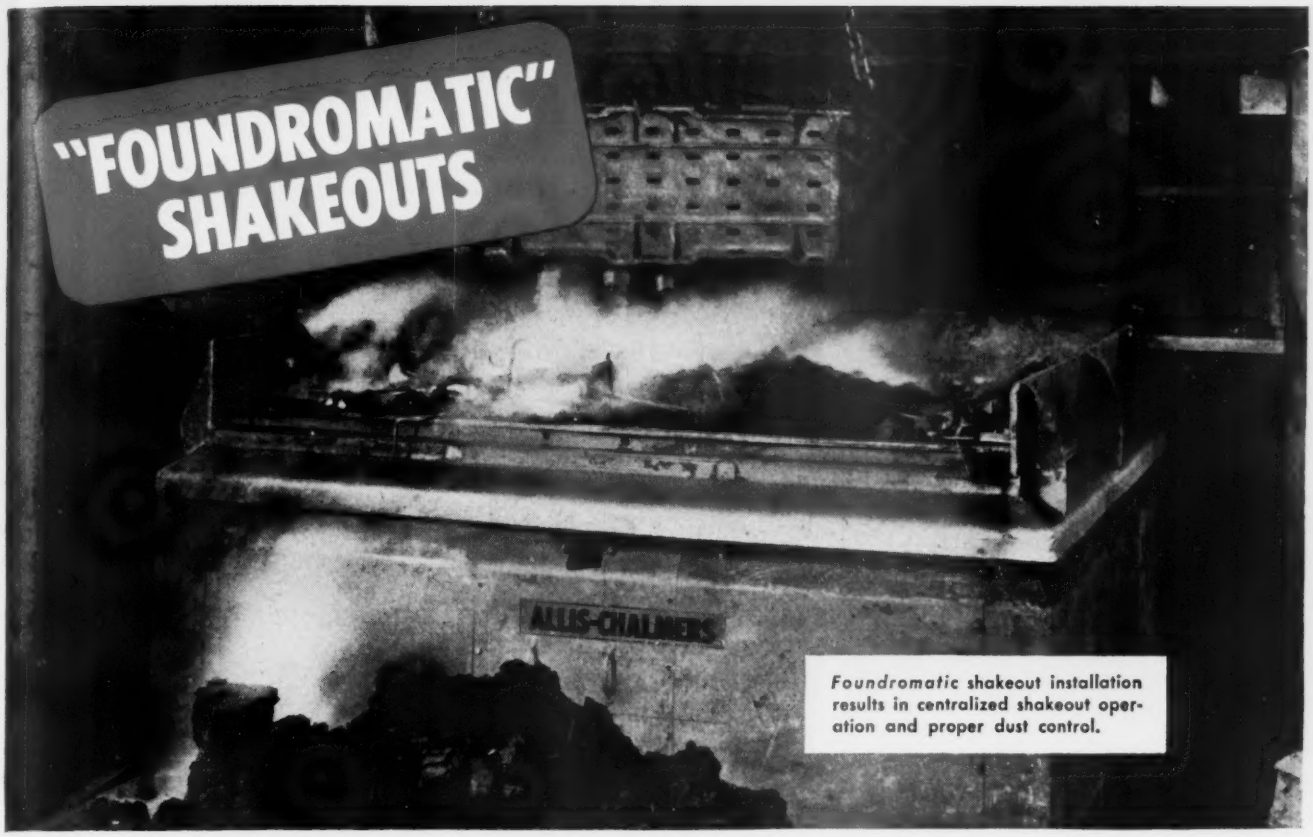
R. Lavin & Sons, Inc.


PLUMBING ENGINEERS ADVOCATE...
Brass Castings for Corrosion Resisting Qualities!
FIVE THOUSAND YEARS of human experience is adequate testimony that Copper Alloys effectively resist the destructive forces of corrosion. Throughout the ages and especially today, Brass and Bronze Alloys coupled with skillful craftsmanship, consistently prove themselves best for plumbing installations. That is why . . .
PLUMBING ENGINEERS ADVOCATE
BRASS CASTINGS
FOR CORROSION RESISTING QUALITIES!
R. LAVIN & SONS, INC.
Refiners of Brass, Bronze and Aluminum
3426 SOUTH KEDZIE AVENUE · CHICAGO 23, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

* Audited Circulation plus pass-on readership.

REPRINTS OF ENTIRE *Brass Castings* SERIES ARE YOURS FOR THE ASKING

The Foundryman's Problems . . . Are Our Problems!



Foundromatic shakeout installation results in centralized shakeout operation and proper dust control.

Clean Up Your Foundry!

With old shakeout methods, valuable floor space was used for molding sand and no dust control was possible. Alloy steel casting seen here being dumped directly onto the foundry floor.

IMPROVED WORKING CONDITIONS resulted when a *Foundromatic* shakeout was installed at this large western foundry. (Company name will be furnished upon request.)

Look at the photo in the column at left, showing a flask being shaken out by the old method formerly used at this foundry. Compare it with the photo above, showing the same operation on the 8 x 10 ft, 25 ton capacity *Foundromatic* shakeout at this foundry.

The company is so satisfied they also have installed *Foundromatic* shakeouts at their Chicago Heights, Denver and St. Louis foundries. Is *your* foundry still using slow, dusty methods of shaking out flasks? Consider the improved working conditions and other benefits a *Foundromatic* shakeout installation will bring:

INCREASED OUTPUT — Shakeout can break up molds as soon as castings are cool, leaving floor area free for reuse. Better working conditions improve efficiency.

LOWER COST — Man-hours for shakeout or core knockout operations are radically reduced, using the same *Foundromatic* shakeout. Flask maintenance minimized. Heavy duty stress-relieved body, with oversize bearings in vibrating mechanism, gives long service. Hourly cost of operation is low.

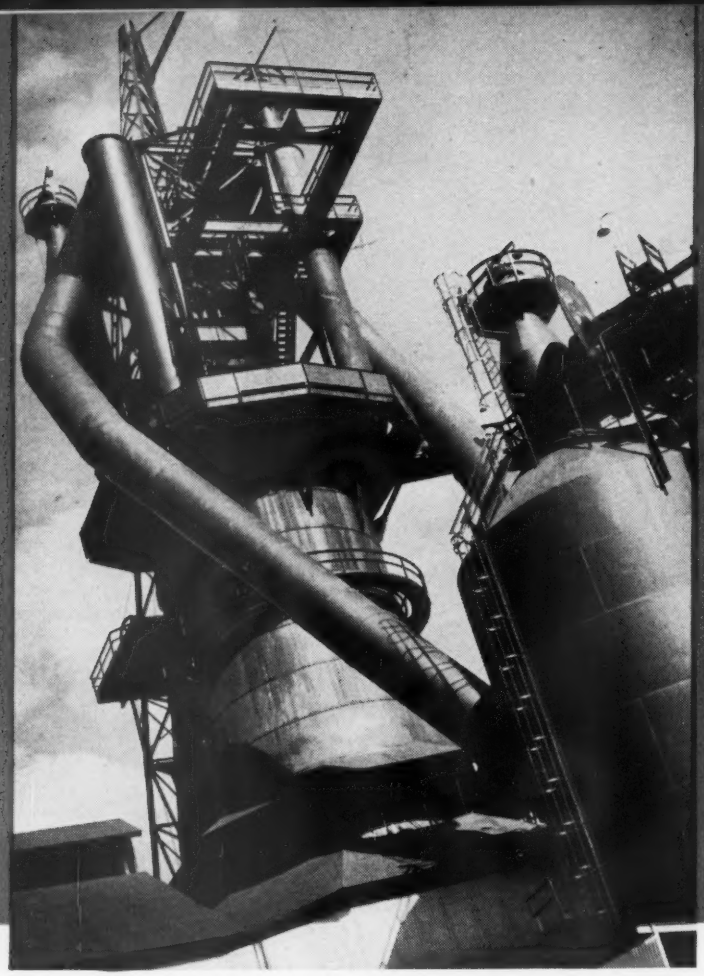
Foundromatic shakeout single units range in capacity from one ton to 25 tons . . . multiple units available for over 100 tons. Call your nearest A-C sales office for information, or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletins 07B7532, up to 5,000 lb, or 07B6365A, up to 25 tons. A-3394

ALLIS-CHALMERS

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

Foundry Equipment for Bigger Output-Better Working Conditions!

VIBRATING SCREENS | CUPOLA BLOWERS | MOTORS-DRIVES CONTROL | FOUNDROMATIC CORE DRYER | INDUCTION HEATING & MELTING | REGULEX ARC FURNACE CONTROL



• • • • The world knows of America's fabulous steel production. It knows that our capacity to fashion the weapons of war is a fearsome thing.

And we know that steel has contributed more than any other industry to our daily lives. Everything we use . . . from toothbrushes to neckties . . . starts with steel.

The development of better refractories for every step in steel . . . and tremendous advances in production . . . have helped largely to make possible steel's progress. General Refractories is proud of its part.

Hot Air That Talks Sense

GENERAL REFRACTORIES

GENERAL REFRACTORIES COMPANY

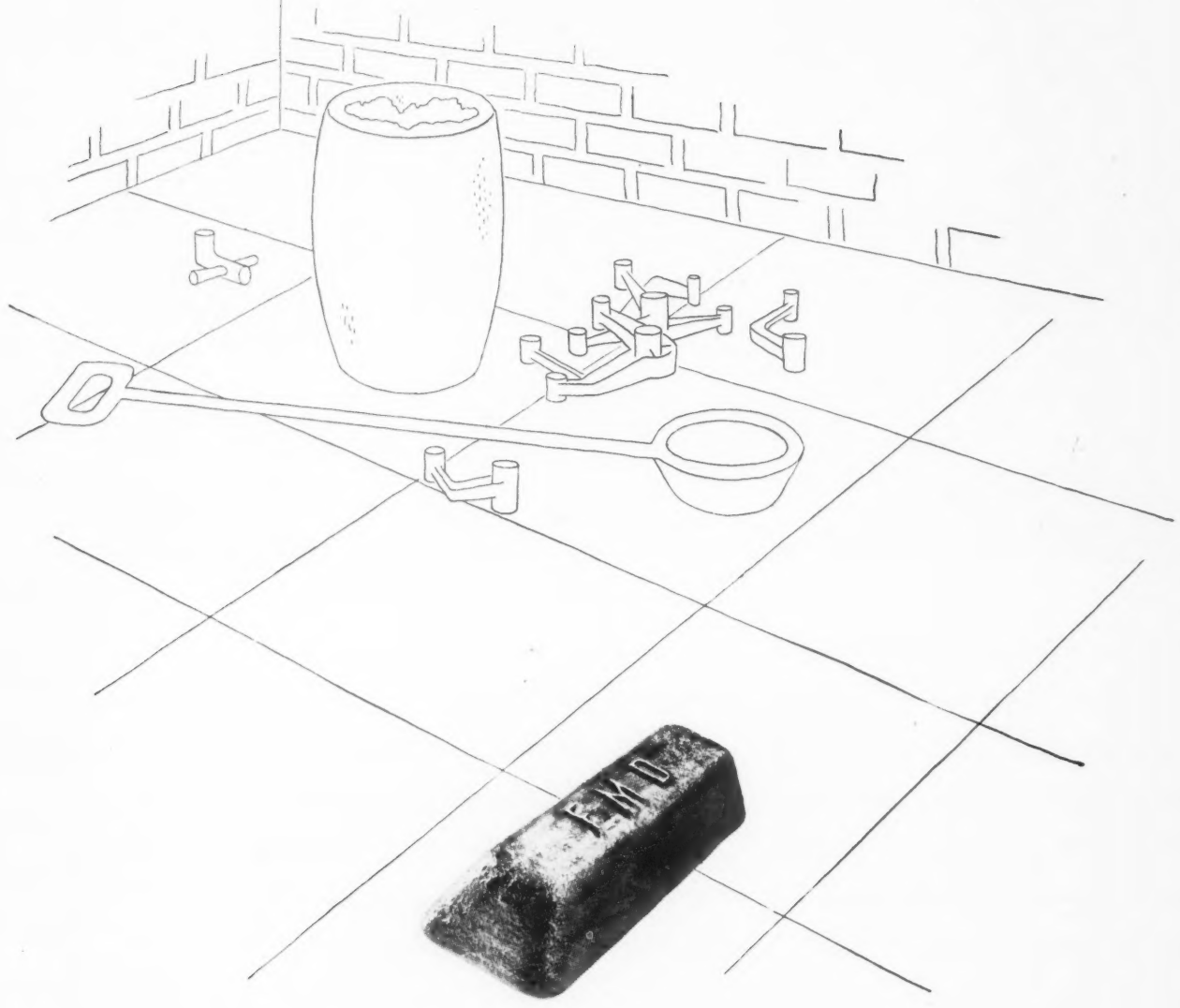
PHILADELPHIA

General's OLIVE HILL fireclay brick lines this blast furnace. And elsewhere in the plant you'll find General Refractories silica brick, basic brick, plastics, castables and bulk products. There's scarcely a heat application for which General does not supply a refractory.

General's extensive research facilities and modern production methods . . . General's 43 mines, 29 plants, 18 sales offices and 200 distributing agencies . . . are at your service. If you have a refractory problem, depend on the company that offers a complete refractories service.

A Complete Refractories Service

Do You Have Supply Problems With Non-Ferrous Alloys?



The demand for non-ferrous alloys mounts daily as defense production speeds up. This means that an alloy you are accustomed to using may sometimes be temporarily unavailable.

Usually, however, there is more than one alloy which will meet the specifications of any job. Choosing the alloy that is both *available* and fully *satisfactory* is the problem.

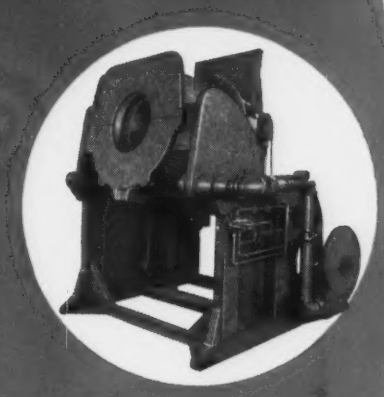
The answer is as simple as talking to your Federated salesman. While he is not a metallurgist as a general rule, he does work closely with the metallurgists in Federated's laboratories. Through this close contact, he has a fund of current metals' knowledge . . . of availability, research, production, of all metallurgical characteristics . . . that is yours for the asking.

You can tap these resources to your own advantage. Let your Federated salesman help you turn a supply shortage into a production advantage.

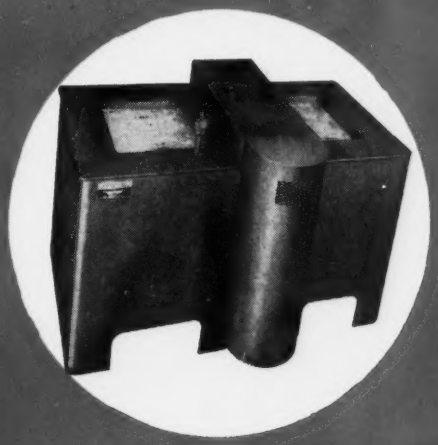
Federated Metals Division

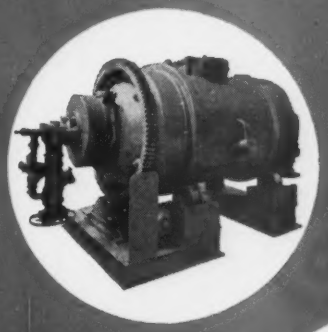
Federated first in the non ferrous field FMD

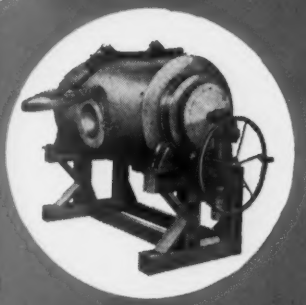
AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.



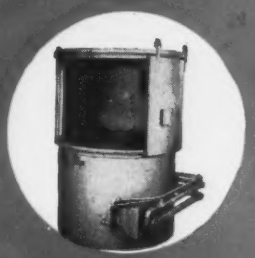
MELTING AND HOLDING FURNACES







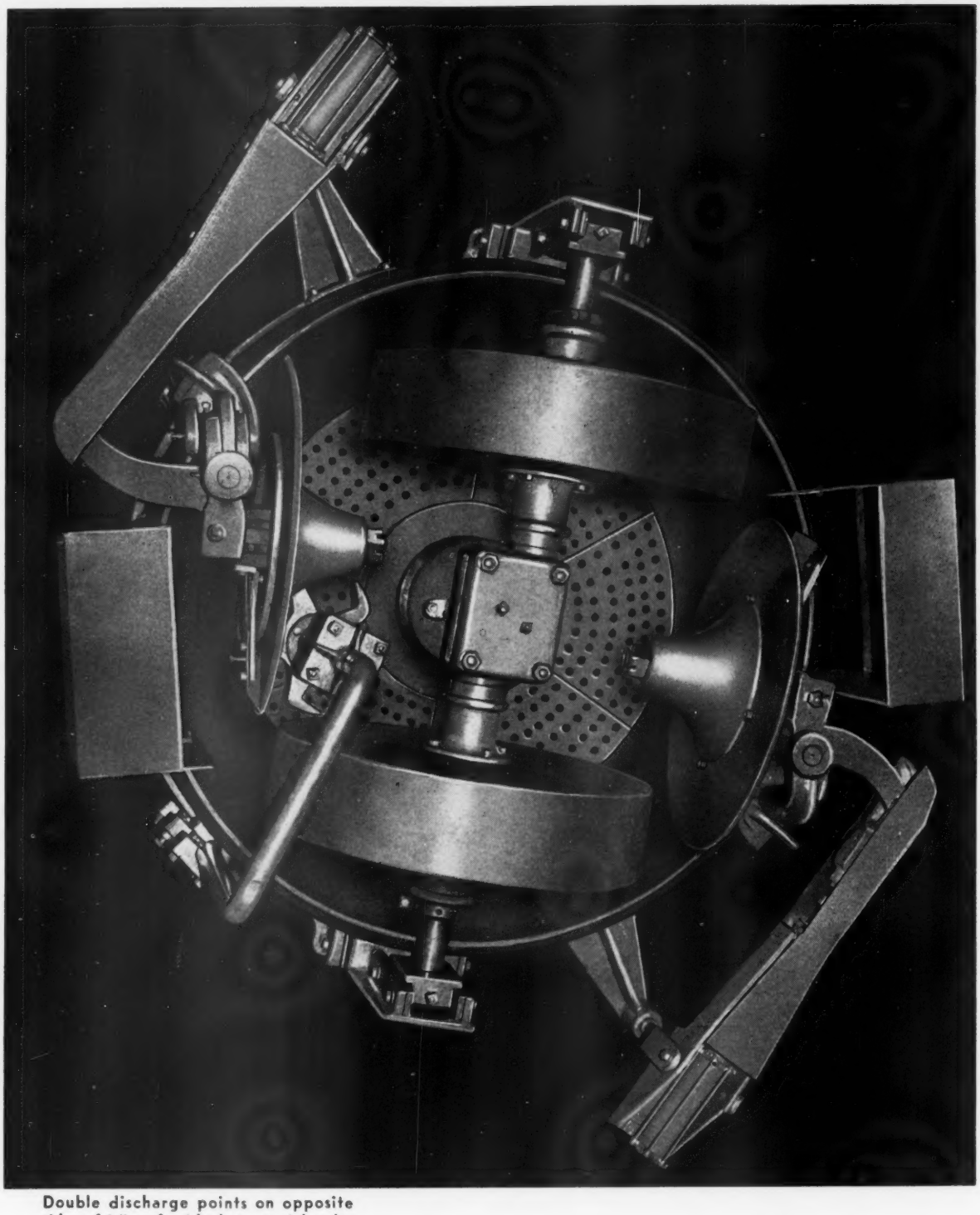
Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.



Bulletin 551 covers the complete melting line. Write for your copy today.

LINDBERG-Fisher A DIVISION OF LINDBERG ENGINEERING CO.

2453 WEST HUBBARD STREET · CHICAGO 12, ILLINOIS



Double discharge points on opposite sides of Mixer furnished on special order only. Standard model has one discharge point.

you always get properly prepared sand with a . . .

Clearfield Mixer

Proper preparation of sand for good foundry results is a matter of precision—and can be consistently accomplished only by equipment engineered, designed, and built to encompass all the many factors involved. And that's a perfect description of Clearfield Mixers. There's a Clearfield Mixer to meet any sand preparation need. Write today for catalog No. 79 for complete details.

CLEARFIELD
MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U.S.A.

HIGH FREQUENCY INDUCTION FURNACES such as this are lined to last with Norton RM1169 MAGNORITE* refractory cement.

Melt More Metal Per Lining

. . . with Norton refractory cements

Whether you are melting ferrous or non-ferrous metals, you will find it worth your while to use Norton refractory cements, available in a wide range of mixtures for a variety of applications.

Norton RM1169 MAGNORITE refractory cement, for instance, is widely used for lining high frequency induction furnaces which melt stainless steel and refractory alloys. It has a maximum-use temperature of 3250° F.

Norton RC1188 CRYSTOLON* refractory cement is popular for lining and patching crucible melting furnaces and reverberatory furnaces which melt brasses and bronzes. It has a maximum-use temperature of 3050° F.

Norton RA1144 ALUNDUM* cement makes long-lasting linings for indirect and direct arc furnaces in many ferrous and non-ferrous metal-melting jobs. It has a maximum-use temperature of 3150° F.

For detailed description of the twenty applications of Norton cements in metal-melting furnaces — as well as other uses for these long-lasting refractory cements — send for Bulletin 863. NORTON COMPANY, 306 New Bond Street, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON

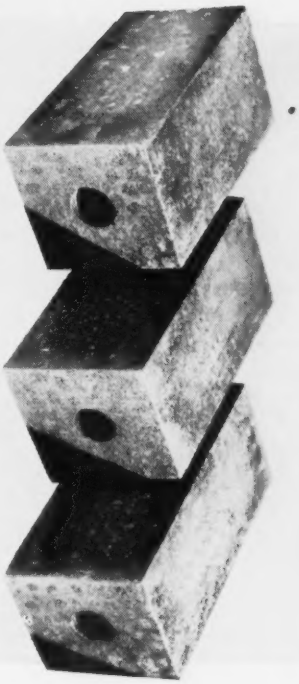
Special REFRACTORIES

Making better products to make other products better

Canadian Representative

A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

These long-lived slag hole blocks



help cut down campaign interruptions

Norton CRYSTOLON slag hole blocks hold their hole size from 8 to 30 hours, resist slag action 5 to 15 times longer than fire clay blocks. No softening, spalling, cracking at temperatures as high as 3050° F. More and more foundries are avoiding campaign interruptions, getting more production per shift by specifying Norton CRYSTOLON for their slag hole blocks.

See for yourself!

Compare the performance of Norton CRYSTOLON slag hole blocks with blocks you are now using. Give them a workout in your cupolas. For prices or complete information, see your nearby Norton representative or write us direct.

NORTON COMPANY
306 NEW BOND STREET
WORCESTER 6, MASS.

Test 'em!

"Yes, I've tried 'em all — but I'll take Dixon's!"

DIXON EXPERIENCE SPELLS THE DIFFERENCE!

IN TEST AFTER TEST by foundrymen, Dixon "Carbond" Crucibles are proving that they assure the very tops in BALANCED crucible performance.

Behind every Dixon crucible there is *over a century* of experience—accumulated *know-how* in crucible making that only years of research and development, years of manufacturing experience, can make possible.

Why don't *you* test Dixon "Carbond" Crucibles? You be the judge of how many heats they are good for, how clean they keep on the inside, how well they take the heat and hold it, too. See for yourself what is meant by "tops in BALANCED crucible performance."

DIXON PRODUCTS

Crucibles	Pre-formed Furnace Linings
Stoppers	Furnace Covers
Ladle Liners	Refractory Cements
Base Blocks	Specialties

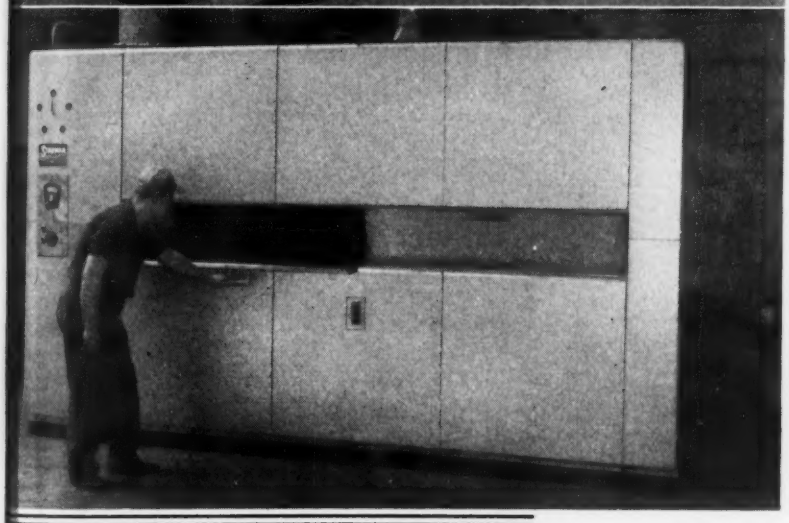
JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY 3, NEW JERSEY

DIXON'S CRUCIBLES — EXCELLENCE — D — SINCE 1827 — STOPPERS & REFRACTORIES

Over a Century of Experience SPELLS THE DIFFERENCE

NEW! STROMAN Revolving Tray CORE OVENS



Yes Sir, here they are . . . Stroman Revolving Tray Core Ovens for the baking of the smaller type of cores in both production and jobbing foundries. These ovens are Indirect Fired and incorporate the famous Stroman Recirculating Heat principle that assures the cleanest type bake as well as the most economical. No products of combustion can enter the baking chamber so cores are free from soot and other discolorating combustion gasses. The Stroman Revolving Tray Core Oven permits the cores to pass through all zones of heat in the oven, and provides the most uniform baking. Stroman Core Ovens are completely automatic in operation, all controls for complete oven operation are at the operator's finger-tips. All operating Mechanism and combustion equipment is concealed behind sliding doors and is kept free from dust, etc. Trays are *completely stabilized,* and will not swing, jitter, or sway. A tray indicator tells the operator where every tray is at all times. Heavy insulation makes it a very cool oven to work around. Split doors make it unnecessary to open the complete oven at one time. When these doors are lowered they form a convenient rest for the core boards while charging. There is a high temperature light in the oven that gives perfect light for bake inspection.

All in all they are the most efficient core ovens for your foundry. They provide perfect heat for speedy but perfect core baking. Fired by gas, oil or combination—gas or oil burners, they will do your core baking better and at decided savings. Here are the sizes . . . one will fit your needs:

No. of Trays	Tray Sizes
4	26" x 76"
5	26" x 76"
5	26" x 96"
5	26" x 112"
7	26" x 96"
8	26" x 96"
8	26" x 112"

MANY SIZES READY FOR SEPTEMBER DELIVERY!

Write for complete specifications and prices today.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

Now.... DELTA

96·B SAND RELEASE AGENT

PREVENTS STICKING ...MAKES SAND FLOW FREELY

Another Foundry "First" by **DELTA**

HAS BEEN PROVED AND ACCEPTED BY LEADING FOUNDRIES

By adding only 8 ounces or less of DELTA 96·B SAND RELEASE AGENT, per ton, to your core or molding sand mixes, your sands will flow freely . . . be easier to handle . . . easier to use. They will not stick to core boxes or patterns no matter how intricate they may be.

DELTA 96·B SAND RELEASE AGENT is the result of persistent research by DELTA Laboratories devoted to the discovery and development of a lubricant-dispersant for use in sand mixes. DELTA 96·B is a liquid which provides properties hitherto unknown in sand conditioning materials. It is completely volatile at elevated temperatures and does not contaminate the sand.

Prove it yourself in your own foundry. Ask for a test sample. No cost or obligation. You will also receive instructions for use. Write today.

READ WHAT USERS SAY ABOUT DELTA 96·B SAND RELEASE AGENT

". . . . with the addition of 96·B we get improved core density and more uniformly-rammed mold hardness."

". . . . with the addition of 8 ozs. of Delta 96·B we are now able to blow cores we otherwise couldn't blow."

". . . . Delta 96·B gives the sand improved flowability. Our sand now works much more freely and leaves the core boxes clean."

". . . . and the trouble we had with sand sticking in the hoppers, in the chutes and on the conveyor has been eliminated with the use of Delta 96·B."

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

How TIMKEN® bearings carry more weight with less wait

THIS picture shows Palmer-Bee mold trucks in use at the Caterpillar Tractor Co. foundry. To assure uninterrupted production, the trucks are mounted on Timken® tapered roller bearings.

Down-time for maintenance is kept to a minimum, because Timken bearings permit tighter closures that keep out foundry dust, sand and moisture. Lubricants are retained longer, eliminating frequent lubrication.

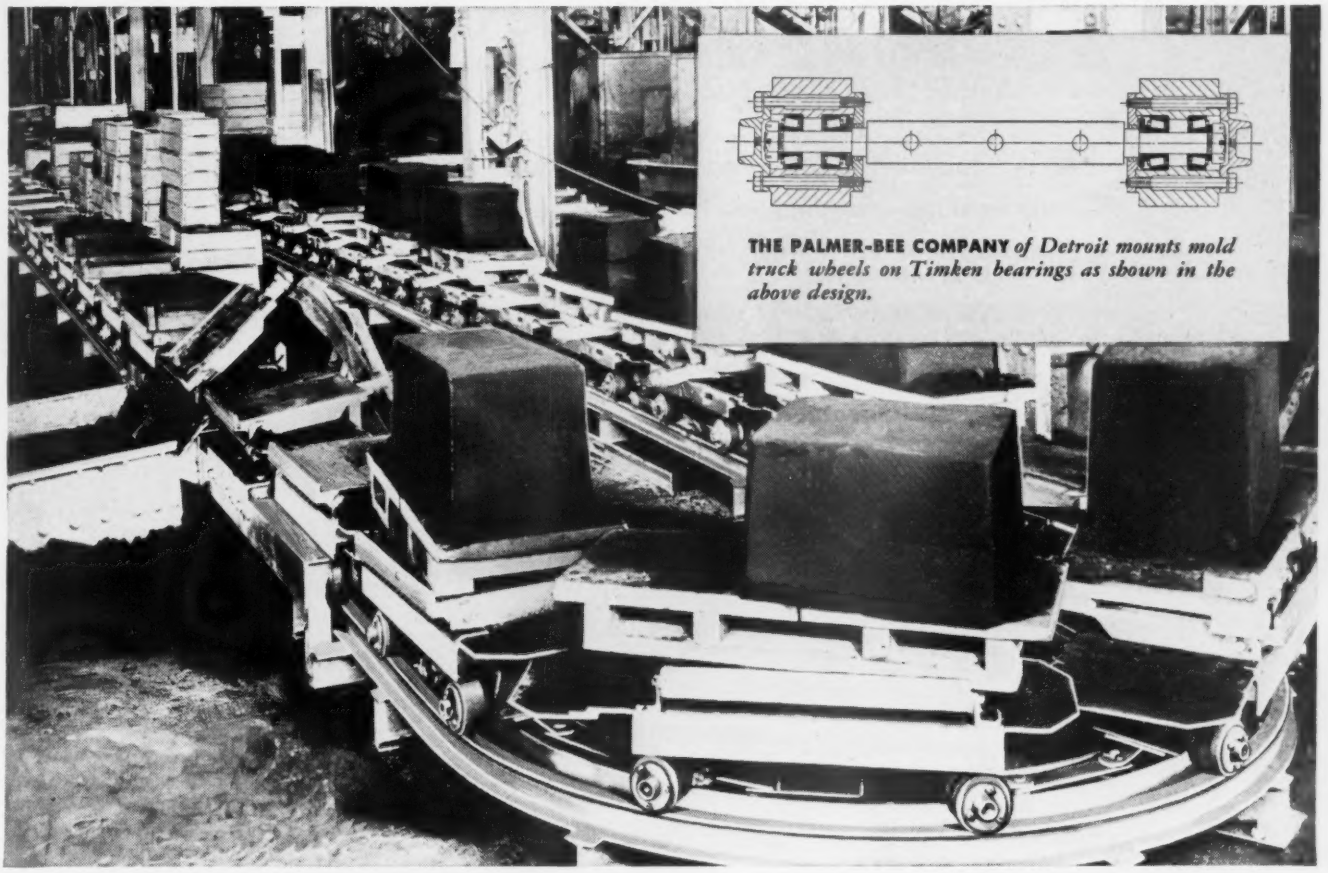
Line contact between the rollers and races of Timken bearings gives extra load-carrying capacity. And because of their tapered design, Timken bearings take any combination of radial and thrust loads.

Made of Timken fine alloy steel, Timken bearings normally last the life of the mold truck. Case-hardened surfaces give Timken bearings unusual resistance to wear. Tough cores enable them to withstand heavy shock loads.

No other bearing can give you *all* the advantages you get with Timken tapered roller bearings. Look for them in all the equipment you build or buy. And insist on the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



THE PALMER-BEE COMPANY *of Detroit mounts mold truck wheels on Timken bearings as shown in the above design.*

WE MAKE OUR OWN STEEL

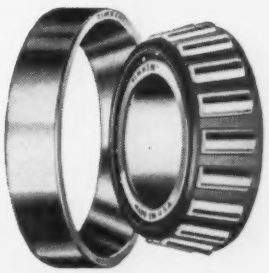
The special grade alloy steel which gives Timken bearings their strength and resistance to wear, is made in our own steel mills.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ◫

OUTSTANDING RESULTS WITH

TAM*

ZIRCONITE

ALL-PURPOSE PASTE WASH

- An outstanding advantage of TAM Zirconite paste wash is that any washing solution made from it can be used ***immediately after preparation.*** As a wash, it mixes readily and easily with water.

- Because of its high fusion point and other characteristics, Zirconite paste wash has proved to be an excellent material in both ferrous and non-ferrous usage where it assures a smooth casting surface.

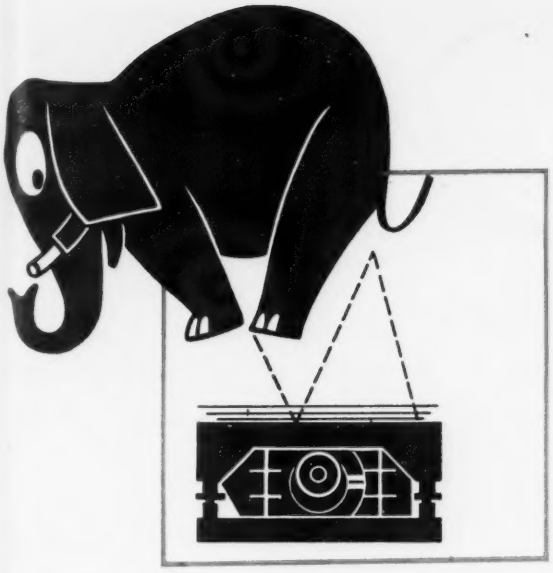
- Multiple bonding agents provide increased resistance to settling ...enable wash to remain on core or mold without peeling, checking or spalling throughout baking or pouring operations.

Our field engineers will be glad to demonstrate the advantages of Zirconite paste wash or you may obtain complete information by writing our New York office. No obligation, of course.

TAM PRODUCTS
Registered U. S. Pat. Off.

*TAM is a registered trademark.

TITANIUM ALLOY MFG. DIVISION
NATIONAL LEAD COMPANY
Executive and Sales Office: 111 BROADWAY, NEW YORK CITY · General Offices, Works, and Research Laboratories: NIAGARA FALLS, N.Y.



SIMPLICITY SPRING-MOUNTED SHAKEOUTS GIVE YOU MORE ACTION TO THE TON

Foundrymen know that it takes plenty of "live action" to knock out cores and shake the sand from flasks and castings that sometimes weigh 100 tons or more. Simplicity Spring-Mounted Shakeouts do this job thoroughly in less time because of the controlled vertical action that's concentrated at the deck where the action will do the most good.

Simplicity's controlled vibration is the secret. In Simplicity Spring-Mounted Shakeouts, vibration is confined to the deck alone. The rigid supporting structure of the shakeout will not vibrate even with a light foundation.

Up on the live deck, you get positive controlled vertical action because of Simplicity Shaft Design and Special Corner Snubbers. This means absolutely no casting travel towards one end of the deck — a dangerous hazard if the casting or flask slips its chains. Flasks last longer and more important, casting damage is completely eliminated.

The massive deck and body construction of Simplicity Spring-Mounted Shakeouts insures dependable operation and lasting service, cuts maintenance costs to a minimum. Available in all larger sizes for use as single units or in combination. For complete information write today to . . .

Simplicity 8' x 10'
Model OA
Special Spring-Mounted
Shakeout

- **Sales Representatives In All Parts Of The U.S.A.**
- **For Canada: Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario**
- **For Export: Brown & Sites, 90 Church Street, New York 7, N. Y.**

99

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICHIGAN

CHAPLETS

Foundrymen have learned there will be no spoiled castings due to faulty Chaplets if they standardize on Shanafelt 'Seal-Tytes.'

Materials are metallurgically correct for thorough fusing in the casting. Uniformity in size of heads and stems is maintained by careful inspection. A full metallic coating keeps them rust proof while in your stock bins.

We specialize in double heads and keep large stocks of most sizes for immediate delivery.

STEEL FLASKS

For 27 years Shanafelt steel Flasks have been helping foundries pour good castings.

The Shanafelt Flask is strong, accurate, and long wearing, yet light in weight for easy handling.

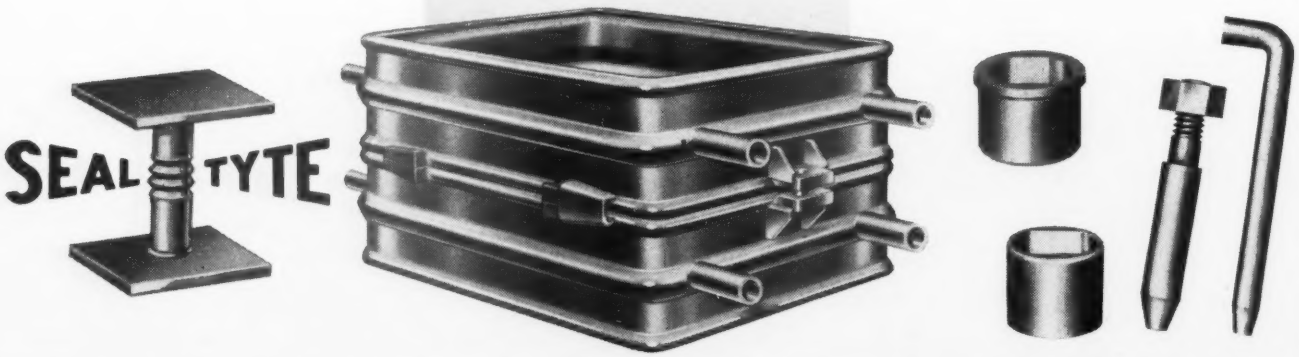
If you have never used Shanafelt Flasks, it will pay you to give them a trial—see for yourself how well they perform under your own production conditions.

FLASK PINS AND BUSHINGS

Shanafelt hardened steel Pins and Bushings are made for smooth and fast line up of the Flask sections.

Many years of Flask experience have taught us how they must be made to deliver results under today's high speed foundry operations.

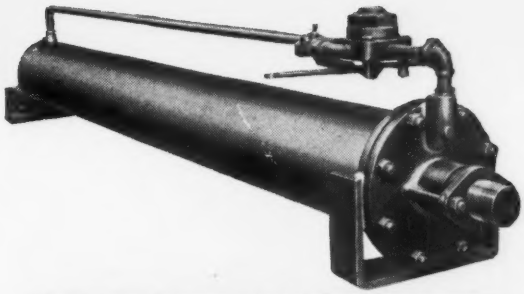
Regardless of what Flask you are using, you'll make no mistake replacing worn bushings and pins with precision-made Shanafelts.



Dependable
SHANAFELT
Products

SERVING THE FOUNDRY INDUSTRY
FOR OVER 57 YEARS . . . . .

THE SHANAFELT MANUFACTURING CO., CANTON, OHIO
2600-2700 WINFIELD WAY N. E.



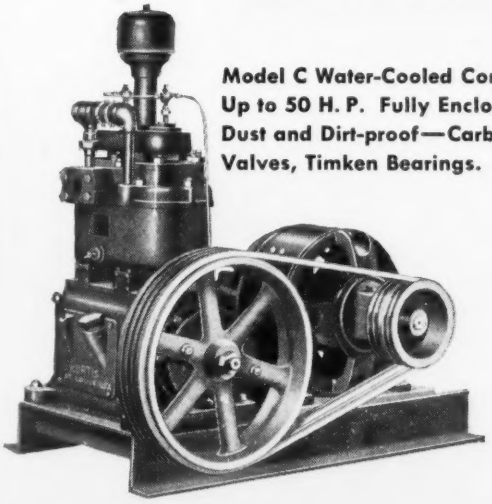
CURTIS
VERTICAL HOISTS
HORIZONTAL CYLINDERS

Do You Have a PULLING PUSHING LIFTING or LOWERING PROBLEM?

—For low-cost handling of materials, machines or component parts

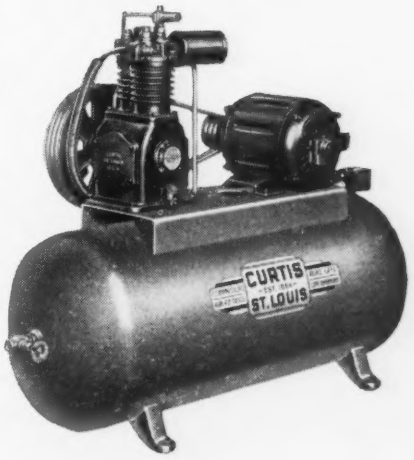
There is a **CURTIS AIR COMPRESSOR**

FOR EVERY INDUSTRIAL APPLICATION



Model C Water-Cooled Compressor, Up to 50 H. P. Fully Enclosed—Dust and Dirt-proof—Carbon-Free Valves, Timken Bearings.

Curtis Model F Air Compressor, Up to 10 H. P., Portable or Stationary.



All Curtis equipment is precision made from top quality raw materials —use coupon below for specific information.

I-51-2

CURTIS

97 Years of Successful Manufacturing

CURTIS PNEUMATIC MACHINERY DIVISION of Curtis Manufacturing Co.
1922 Kienlen Avenue, St. Louis 20, Mo.

I am interested in items checked below:

☐ VERTICAL HOISTS
Stroke ☐ Capacity ☐

☐ HORIZONTAL CYLINDERS
Stroke ☐ Capacity ☐

☐ AIR COMPRESSORS
Capacity ☐ Pressure ☐
Current ☐

Name.....

Firm.....

Street.....

City.....Zone....State.....

synthetic resins

dry core compound

facing sand (FOR GREEN TOPPING CORES)

oil sand

pitch and cereal

with working moistures ranging from 3.5% to 8% and proper green bond strength for individual requirements...

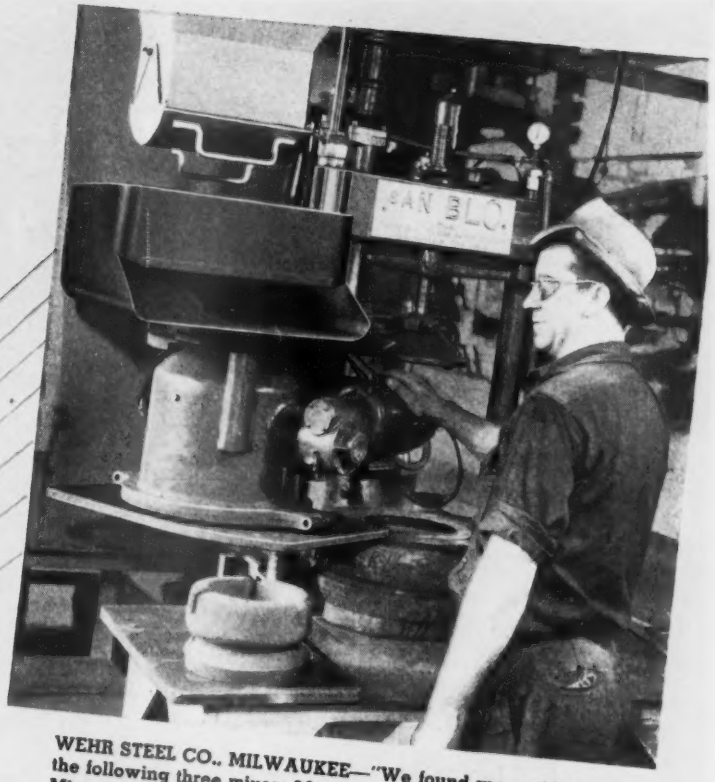
are being blown on the new SAN-BLO

The FEDERAL FOU

4600 EAST 71st STRE

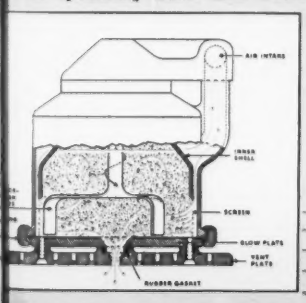
CHICAGO • DETROIT • MILWAUKEE • NEW YO

ATLANTIC FOUNDRY CO., AKRON—"Core mixture, for sprocket cores being blown on our San-Blo, tests 5.5% moisture, 3.7 lbs. green strength, and 60 permeability. We also found we could blow our runner cups."



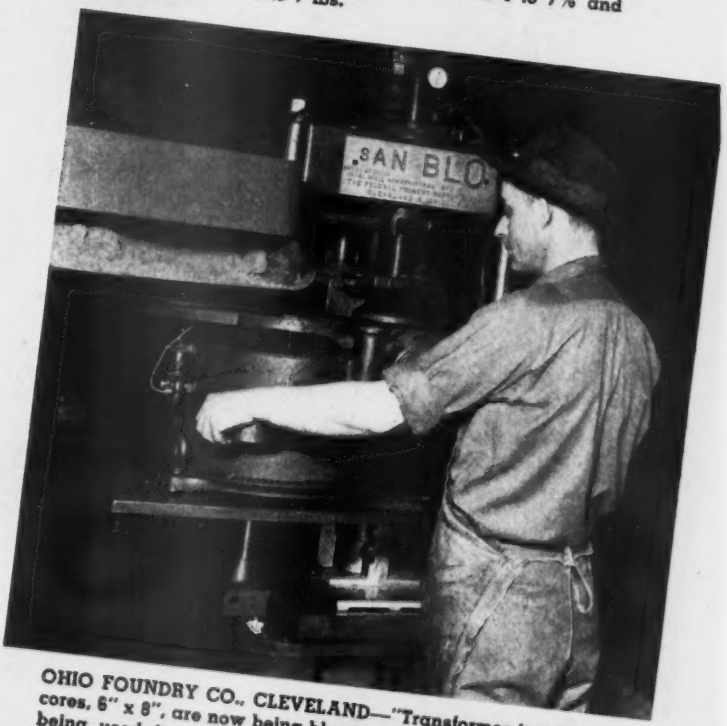
WEHR STEEL CO., MILWAUKEE—"We found we could blow the following three mixes: 3% Woodflour Mix, 4% Dry Binder Mix and 30% Silica Flour Mix. Moisture from 4 to 7% and green strength from 3 to 7 lbs."

The SAN-BLO can blow these non-flowable core mixtures because motor-driven plows in its blow head move sand mechanically to the blow hole. Air is used only to aerate sand in the lower part of the blow head and convey it into the core box. Follow the green arrows and you'll see how air enters the blow head, fluffs up the sand as the plows move it toward the blow hole, and finally picks up the sand, at full pressure, to carry it quickly into the core box.



You, too, can blow non-flowable mixtures, but only with a SAN-BLO!

FOR FULL INFORMATION, WRITE FOR BULLETIN CB-2



OHIO FOUNDRY CO., CLEVELAND—"Transformer insulator cores, 6" x 8", are now being blown easily and rapidly. Sand being used for these cores tests 8% moisture and 6 lbs. green bond strength."

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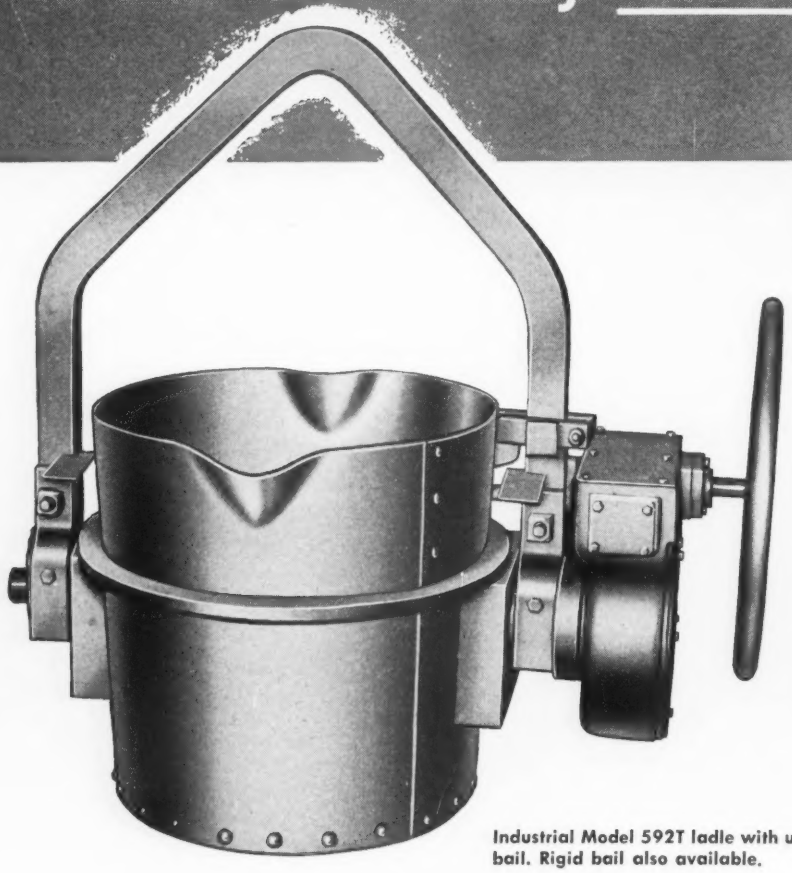
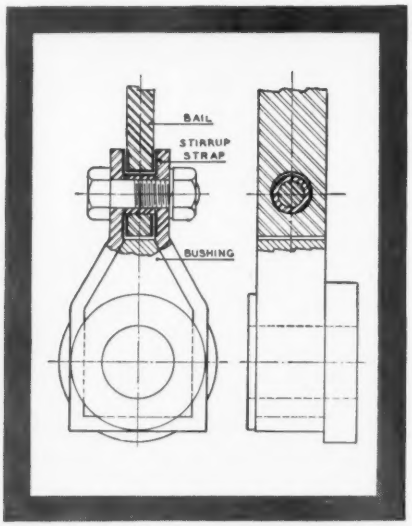
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

AT LAST... Binding due to heat distortion COMPLETELY ELIMINATED in this revolutionary Universal Bail Design





More flexibility than a universal joint. Ample vertical and horizontal adjustments. Misalignment taken care of by rotating swivel action.

Industrial Model 592T ladle with universal bail. Rigid bail also available.

Here is one of the really fundamental advances in geared ladle design. Binding problems caused by the steady rise in pouring temperatures have been solved . . . with no sacrifice in strength, safety, or simplicity.

You get four distinct advantages with this new universal bail by Industrial Equipment:

1. Binding due to heat distortion is eliminated.
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3. Gear wear due to binding is eliminated.
4. No lubrication or adjustment is ever needed.

This new bail is the result of a project on which Industrial Equipment has been working for over four years. Many novel and ingenious designs were proposed and discarded before the final design was accepted. Like all good things it is simple. Yet notice that in addition to simplicity it is rugged, safe, and dependable.

You should also know that this new bail has been thoroughly foundry tested. We emphasize this because the more severe the conditions, the more evident was its design superiority. Operators, for example, say they have never operated a ladle that was easier to handle *regardless of conditions.*

Look to Industrial Equipment for the really basic improvements in foundry pouring and handling equipment. *Write, wire, or telephone today for full details.*

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North American

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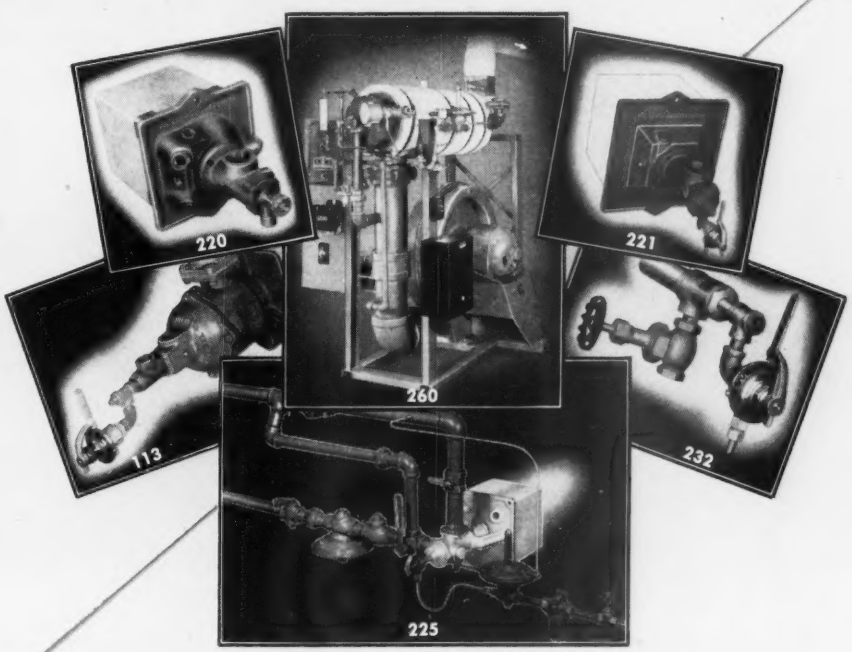

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*Dual-Fuel: The North American name for burners designed especially for both gas and oil. Fuel changed by merely turning valves.

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BRANCH OFFICES *with* FIELD ENGINEERS *in* PRINCIPAL CITIES

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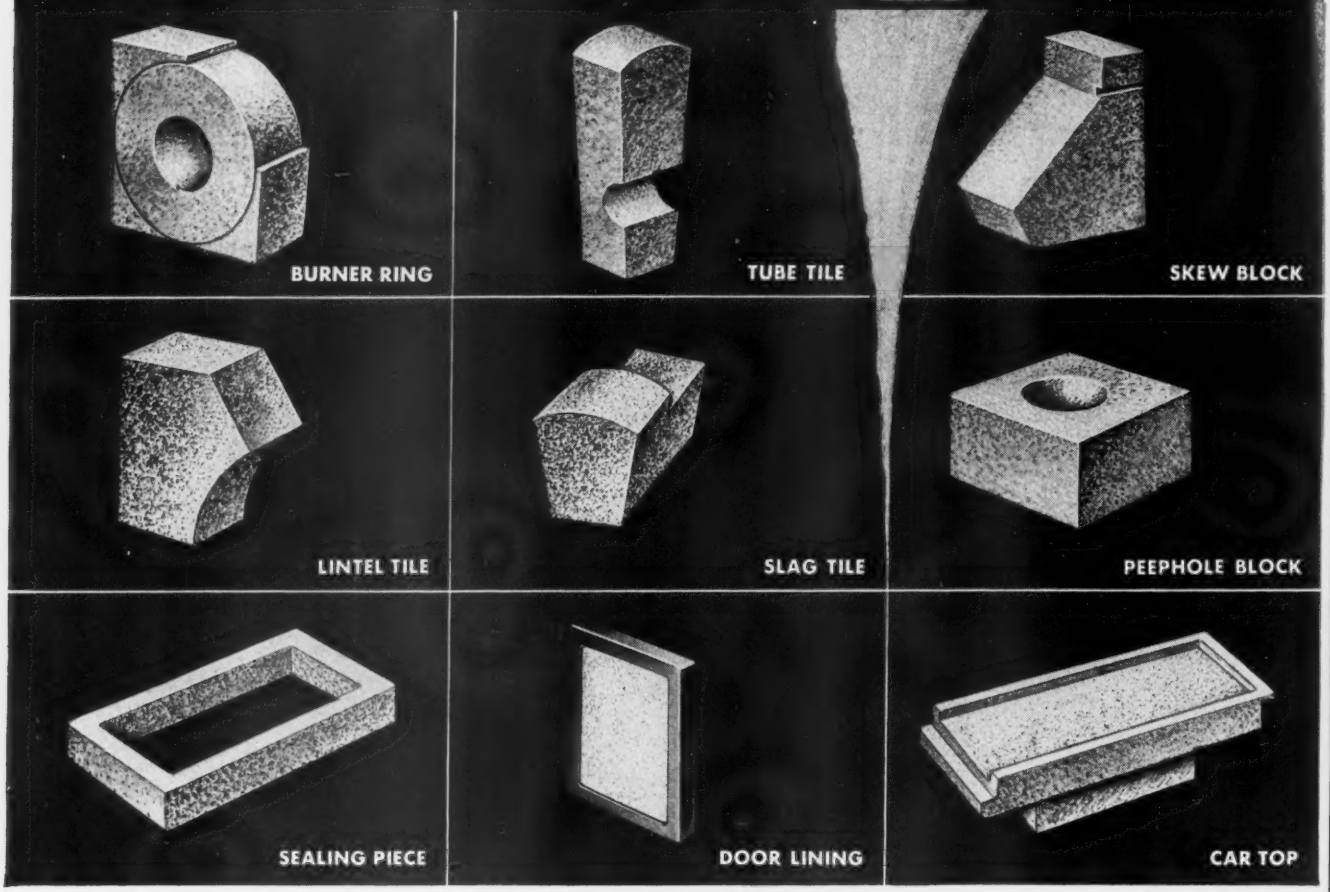
Versatile **B&W KAOCAST** *eliminates expensive delays*

WHAT SPECIAL REFRACTORY SHAPES DO YOU NEED QUICKLY?



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Put B&W Kaocast to work in your plant. This money saving refractory is another product of B&W's 30 years of specialized refractories engineering. Consult your B&W Refractories Engineer, or write for Bulletin R-22.

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R-397

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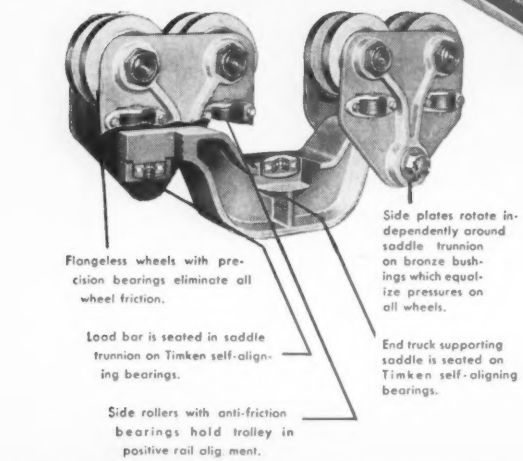
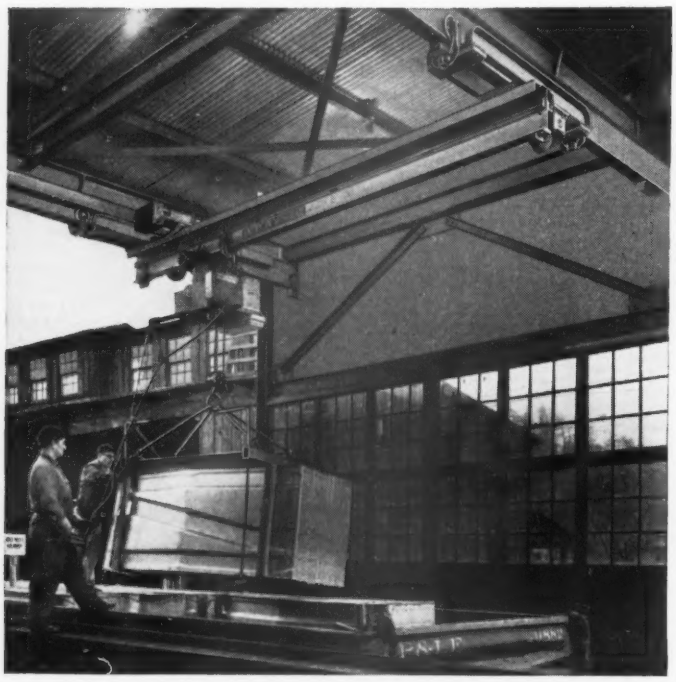
for **constant service**


Flangeless wheels with precision bearings eliminate all wheel friction.
Load bar is seated in saddle trunnion on Timken self-aligning bearings.
Side rollers with anti-friction bearings hold trolley in positive rail alig ment.
Side plates rotate independently around saddle trunnion on bronze bushings which equalize pressures on all wheels.
End truck supporting saddle is seated on Timken self-aligning bearings.



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Applied to American MonoRail Cranes, these articulated trolleys permit constant operation—handling loads up to 10 tons. And with this is offered all the flexibility of MonoRail design for interlocking carrier service between and beyond the craneways.

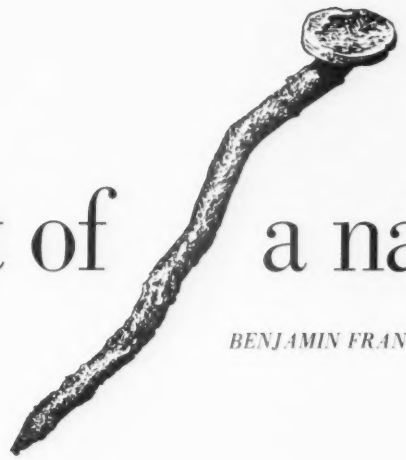
Let an American MonoRail engineer explain all the advantages of these new cranes, or write for complete information.

THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE **CLEVELAND 7, OHIO**

"For the want of a nail the shoe was lost,
For the want of a shoe the horse was lost,
For the want of a horse the rider was lost,
For the want of a rider the battle was lost,
For the want of a battle the Kingdom was lost . . .

and all for want of a nail"



BENJAMIN FRANKLIN, "Poor Richard," 1758

The fate of nations often hangs on little things. Take this rusty old nail. It symbolizes thousands of tons of worn-out machines and broken parts lying useless in our plants, factories, farms, and homes—scrap steel desperately needed today by our steel mills.

You can help make this nail, and all the other scrap you can collect, go to work again . . . in new steel for ships, tanks, and guns required for defense purposes.

So survey your plant now for every last bit of scrap. Then get it to your scrap dealer promptly. This will not only help assure the nation of the arms needed to preserve our freedom, but it will also mean more steel for your own products tomorrow.

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For internal grinding operations, you just can't beat Chicago Wheels. They give you better finishes faster . . . with no wobble, flutter, or chatter, and size perfectly. Today . . . with production demands soaring, they're your best buy, because they're "tailor made" to your own particular specifications . . . ideally suited for every I.D. requirement.

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Reader's COMMENT

Favors Side Risers

TO THE EDITORS:

While admiring your new covers and general content of FOUNDRY, we cannot say the same for the article "Why Castings Shrink" presented in the "ABC of Foundry Practice" section, page 222, June issue.

Generally it is not considered good practice to place risers on top of gray iron castings or to churn risers with a rod. Side risers will give much better results. No mention was made of the definite advantage of round over square or rectangular risers. On many castings—die blocks, pressure-resistant castings, etc.—it is good practice to gate through the riser or risers into heavy sections, thus providing hot metal where it will feed effectively, rather than gating as far as possible from heavy sections.

Sharp corners produce hot spots unless prevented by the proper application of fillets. Ribs on opposite sides of a web, plate or wall should be staggered instead of being placed directly opposite each other. The neck or distance between riser and casting should be as short as possible to prevent the metal in this area from freezing before the feeding action is complete. Risers designed to take advantage of atmospheric pressures have proved their worth. No production shop can afford to indulge in the practice of churning risers. It is no longer practiced widely in jobbing shops.

EARL BEYERLEIN

1604 *Deane Blvd.*
Racine, Wis.

* * *

Straightening Castings

TO THE EDITORS:

We note in a recent issue of your paper a request as to straightening castings.

About 1910, we made a number of lathe bed frames about 17 ft long. One of these was so badly warped it couldn't be machined properly. We put the two ends on a foundation made of scrap standard car wheels and in the center put another foundation that was slightly lower than the two end foundations. The frame was put on the two end foundations, and of course there was quite some opening over the middle foundation. In the center of the frame we built up a pyramid shape of old standard car wheels, built a big wood fire around the frame out of cord wood, threw coal oil on it and lit it. The frame eventually came to a dull red heat and gradually settled down until it touched the center support. When cooled it was straight enough for satisfactory machining.

W. WALLACE MCKAIG

McKaig's
Cumberland, Md.

* * *

How Metal Absorbs Gas

TO THE EDITOR:

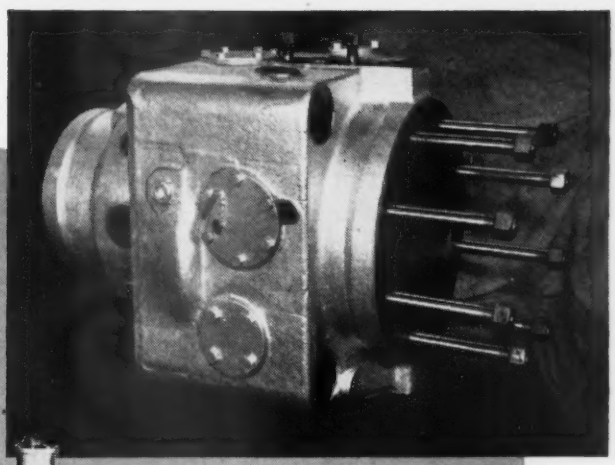
In his article on "Melting Tin Bronze in Indirect Arc Electric Furnaces" in the May 1951 issue, Bruce Schafer has discussed the subject which is of considerable interest to the many, foundrymen who use Detroit furnaces for melting metal. There is considerable evidence to indicate that variations in metal quality exist that can be traced back directly to the manner in which the furnace is operated. Mr. Schafer has covered these possibilities completely and the information should be of considerable value to people using this type of equipment.

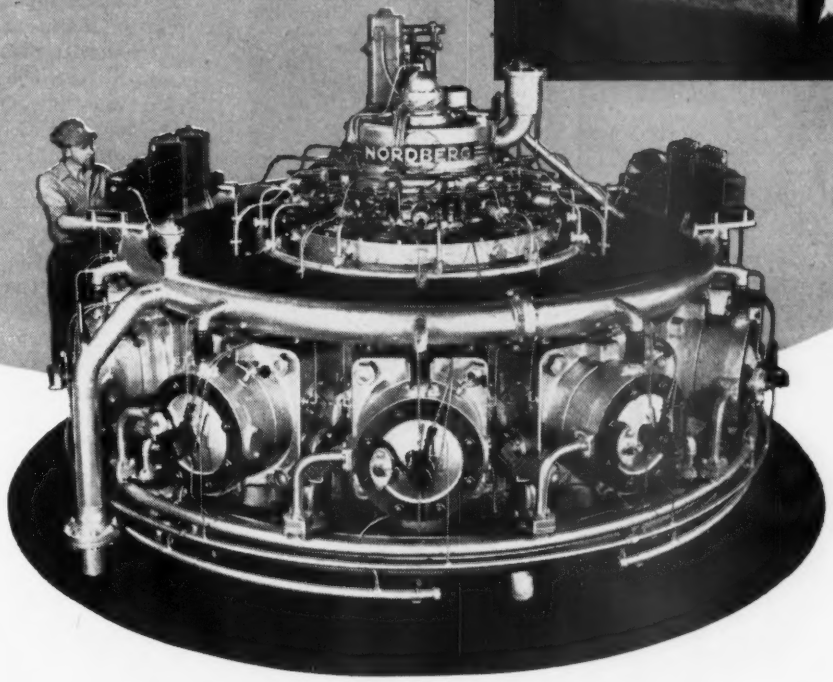
There are several points in this article, however, that I believe could stand amplification and qualification. Mr. Schafer has mentioned that the two principal side reactions involved in the electric furnace which can potentially cause low metal quality, are the dissociation of water vapor as a source of hydrogen, and the presence of finely divided carbon which can lead to the formation of carbon monoxide within the molten metal.

The danger of hydrogen absorption by molten bronzes is not that this gas will be separated upon freezing and cause porosity of its own accord. Rather it is the combination of hydrogen and oxygen within the molten metal prior to solidification that causes most of the gas porosity found in bronze alloys. Hydrogen gas itself has an appreciable solid solubility in most copper-base alloys. Steam, on the other hand, has no solid solubility Consequently, if hydrogen alone were dissolved in a bronze alloy, it is unlikely that it would cause any noticeable amount of gas porosity although, if excessive quantities were present, this possibility does exist.

(Continued on page 62)

Square Cylinder FOR A ROUND ENGINE





another "difficult" casting made easier with CHATEAUGAY PIG IRON

● It's one of eleven cylinders on the 1650-HP Nordberg Radial Diesel shown above. And because it's a one-piece casting, complete with built-in water jacket, adjoining light and heavy sections are encountered. Thanks to CHATEAUGAY Pig Iron, however, there are no problems of partially-filled molds or uneven cooling.

CHATEAUGAY—Republic's *exclusive* premium pig that outperforms all other irons—imparts exceptional fluidity to any mix in which it is used. It fills every section of the mold . . . cools uniformly . . . provides a uniform grain structure that machines readily and economically.

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(*Continued from page* 60)

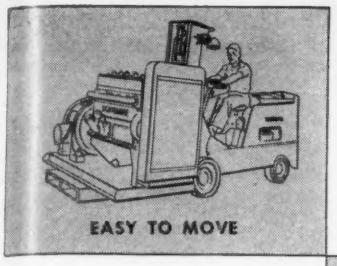
The danger of absorbing hydrogen is not in the gas porosity that this element will form on solidification by itself but rather the fact that metal from Detroit furnaces, and practically every other kind of furnace, is poured under oxidizing conditions. This means that, as the metal stream is poured through air, it can absorb considerable quantities of oxygen. If high-hydrogen contents have been built up in the liquid metal which is then poured through air, the metal may absorb enough oxygen so that upon solidification considerable steam is formed with resultant porosity in the castings. I believe it should be understood that the danger is not from hydrogen gas alone but rather from the combination of hydrogen and oxygen.

It is obvious that the normal sources of hydrogen gas found in fuel-fired melting are not present in the electric furnace. That is, no hydrogen or water vapor is produced as a product of combustion. On the other hand, Mr. Schafer has mentioned numerous sources for hydrogen gas in the furnace so that it is possible that hydrogen will be present in the furnace atmosphere and thereby absorbed by the metal. Work done a number of years ago indicated that in the presence of a strong reducing gas such as carbon monoxide, the hydrogen absorption by bronze would be greatly increased. This may be the most important effect of having a reducing gas such as carbon monoxide present in the atmosphere.

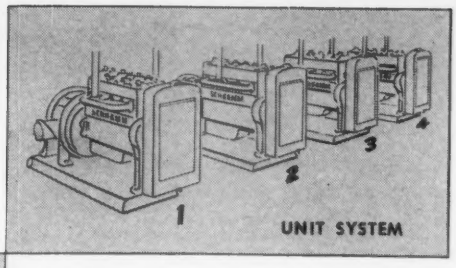
At the present there is no information indicating that carbon monoxide itself has any solubility in the liquid metal. There is information, however, to indicate that carbon itself does dissolve in molten bronze to an appreciable extent. Once again the danger of carbon absorption is that oxygen picked up during pouring may combine with carbon to form insoluble carbon monoxide gas, which then attempts to separate from the metal as it solidifies. This could be a source of gas porosity in castings. It should be understood, however, that there is little likelihood of gas absorption by the liquid metal in the Detroit furnace. Rather the elements contributing to gas porosity are absorbed and if all conditions are favorable, these gas-forming elements will combine with oxygen in the metal as it solidifies to form gases which separate upon solidification.

What Mr. Schafer has pointed out so ably about maintaining furnace operation as efficiently as possibly still holds, although the mechanism of gas formation is possibly somewhat

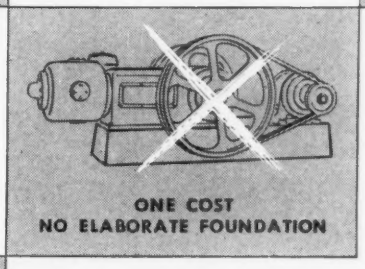
(*Continued on page* 64)



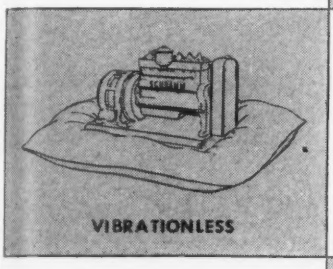
EASY TO MOVE



UNIT SYSTEM



ONE COST
NO ELABORATE FOUNDATION



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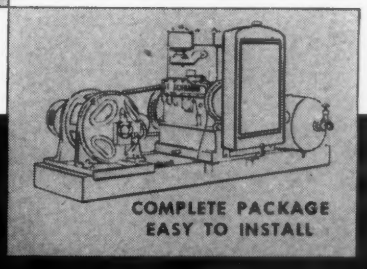

COMPLETE PACKAGE
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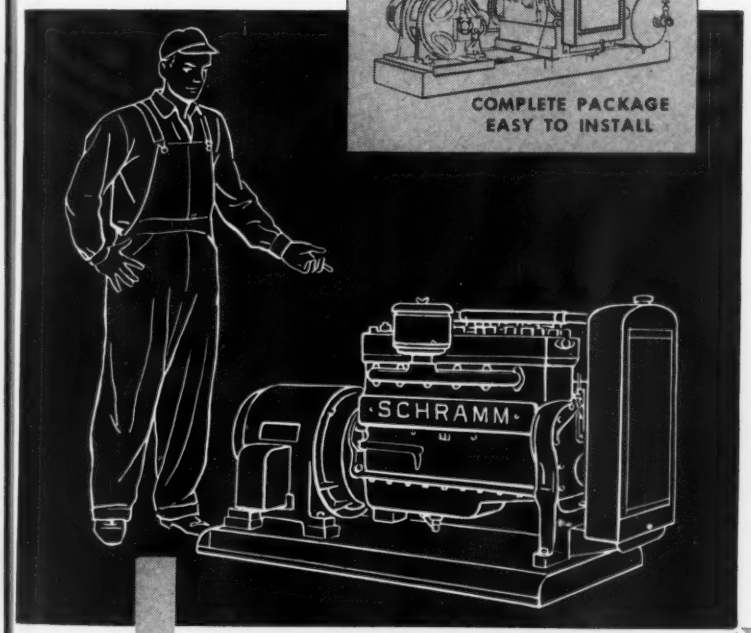

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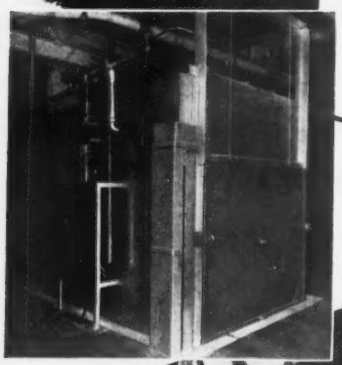

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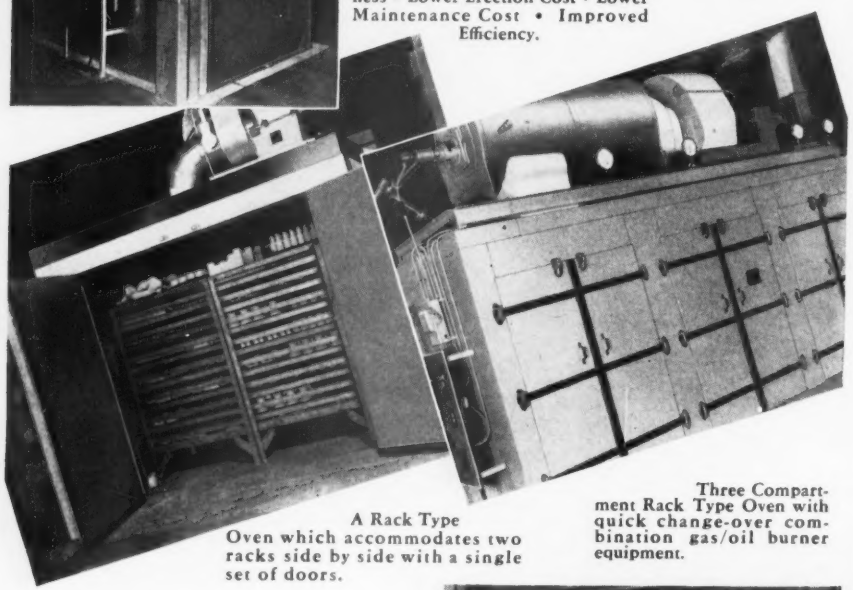
Built-in Air Heater • Built-in Circulating System • Elimination of Duct Insulation • Compactness • Lower Erection Cost • Lower Maintenance Cost • Improved Efficiency.

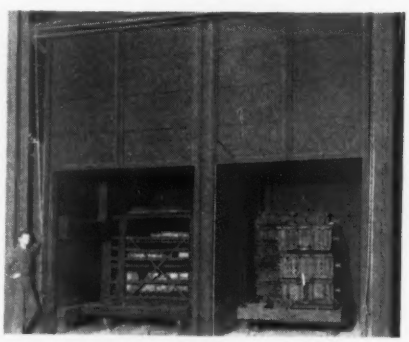


A Rack Type Oven which accommodates two racks side by side with a single set of doors.

Three Compartment Rack Type Oven with quick change-over combination gas/oil burner equipment.

LANLY FOUNDRY OVENS are available in standard units suited for the requirements of the average foundry or can be custom-designed and built for core baking, pasting and mold drying, as well as for casting conditioning and heat-treating.

Write for the Catalog.



A Two Compartment Car Type Mold Drying Oven. Each Compartment individually heated and controlled.

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OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
780 PROSPECT AVENUE CLEVELAND, OHIO

(*Continued from page* 62)

different than that he has described. Obviously, in a furnace which can never be oxidizing in the true sense of the word, it is necessary to minimize the reducing tendencies of the furnace by efficient operation of the electrode so that carbon absorption would be reduced to a minimum. It goes without saying that anything which will inhibit absorption of hydrogen will help metal quality so that good furnace practice is necessary with the Detroit electric type equipment as with any other furnace.

R. A. COLTON
Research Department
American Smelting & Refining Co.
Barber, N. J.

* * *

Hobby Foundry Book Needed

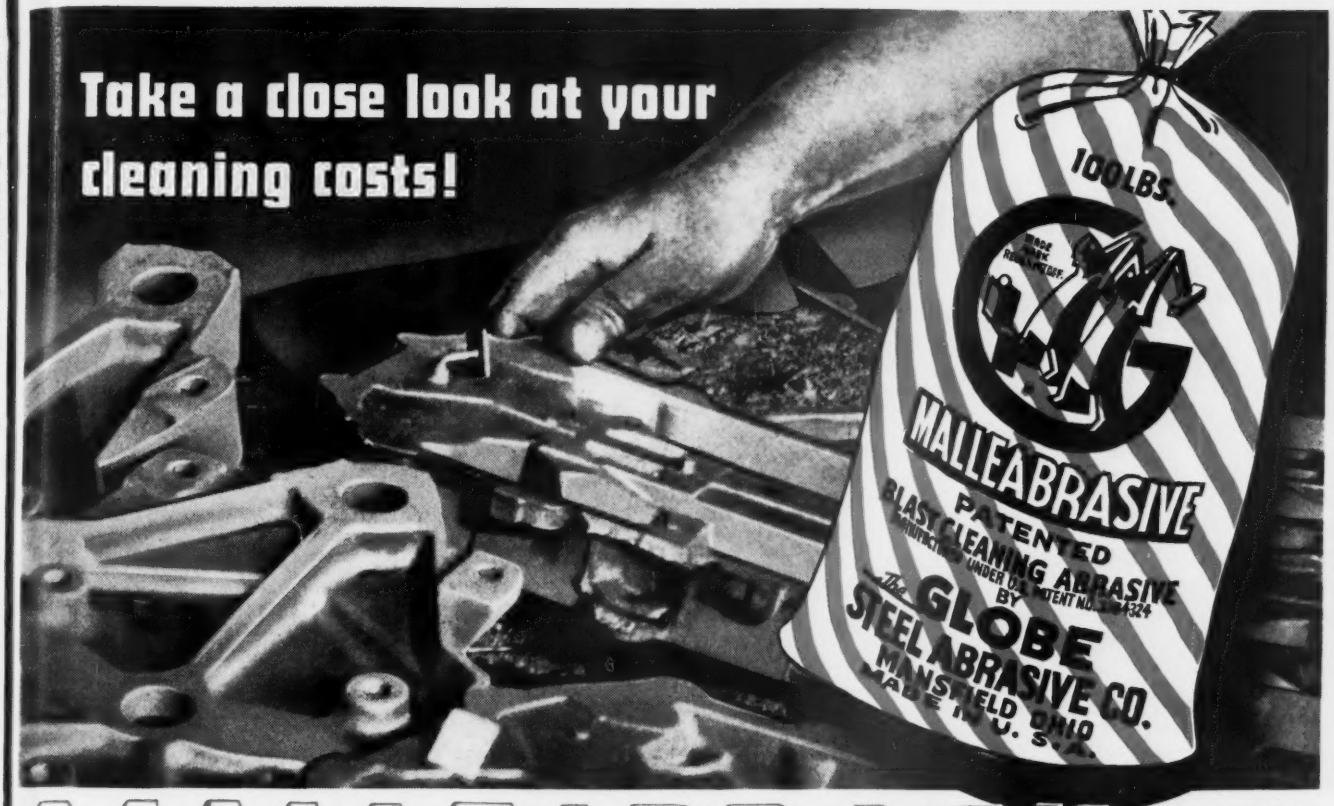
TO THE EDITORS:

As a constant reader of "Man-to-Man on the Molder's Bench," I just must take the time to let you know that I have derived an immense amount of satisfaction and enjoyment from Mr. Lee's column. Occasionally, however, he jogs us up a bit, and while this is not very pleasant at the time and may bring forth a recalcitrant exclamation (none of us really likes to be jogged out of our comfortable well-worn grooves) this, too, is all to the good and forces us to look at things in a different light and to re-examine some of our time-honored if out-of-date practices. This latter exercise, if somewhat painful, is always helpful. I sincerely trust that he will continue to favor us with just the same sort of column he has given us in the past.

The remarks about the "Lee Hobby Foundry" have also greatly interested me, for I have had a secret desire to have just such a small hobby foundry for my own diversion for quite a few years. Until lately, I have not had the time nor been in a position to do much about it, but now things are beginning to shape up a bit better, and I am ready to go ahead with my plans.

My melting unit will probably be a 12-in. cupola, made by ramming a refractory fire clay mix around a form, as from all accounts such a unit will be quite satisfactory in such a small size. Possibly Mr. Lee has tried out various types of ramming mixes for his small cupola lining if he uses this type of lining in preference to block. If he has found any particular mix to give better service than others, I should like to have the benefit of his experience.

My residence is some distance from a supply of foundry coke, but household fuel is readily at hand. It occurred to me that, in such a small



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Every foundryman knows that the relative hardness condition of cores tells its tale in the casting. All the advantages of accurate core-hardness control can be obtained with this direct-reading, Gordon-Campbell Core Hardness Tester. The test results are dependable — and obtained easily in a few seconds. No special skill is required.

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Combination Rammer-Compression Tester—Simple way to prepare specimens to determine compression strength.
Permtester—A foolproof method for determining sand permeability.
Transverse Test Core Maker—For preparing core specimens for transverse tests.
Transverse Core Tester—Rapidly determines transverse strength of dry sand cores.
Baking Oven—Electrically heated, dries sand samples, bakes core specimens.
Moisture Tester—A reliable method of measuring moisture content.
Sand Mixer—For thorough preparation of sample core-sand mixtures.
Sand Washer—The easy-to-use method to determine clay content of sand.

Each of these testing units was designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

Complete information upon request.

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(*Continued from page* 64)

cupola, household fuel coke could be used as the cupola fuel without adversely affecting the composition of the molten iron to too great an extent. I am wondering if, possibly, he has had any experience with regular fuel coke in his small cupola? If it would prove to be satisfactory, then there would be no purpose in hauling an extra load of foundry coke out for the cupola fuel. The regular fuel coke would, of course, have a higher sulphur content, and would have a higher percentage of other impurities, but I doubt if it would be enough to affect the iron in any marked degree when used in such a small unit. At any rate, I would like to know if he has done any experimenting with it for his cupola fuel.

Any suggestions or "tips" that might occur to him that he believes would be of especial importance to a man just starting a small hobby foundry will be most welcome, as there is precious little to draw from in the way of treatises on miniature foundry operation, and big practice may not always be applicable. Possibly, time permitting, some day Mr. Lee might publish his experiences in the "Lee Hobby Foundry" and supply this deficiency. Much material is available on nearly every other type of hobby under the sun, and it is too bad that the foundry should be entirely neglected, as it is a most interesting and fascinating business.

CHARLES W. TADLOCK
6360 *Washington Ave.*
St. Louis 5

* * *

What! No Pig Iron?

TO THE EDITORS:

Some recent items in the "Question and Answer" section of FOUNDRY prompted the following comment:

1. Originally we added a little flour to the clay for botting the cupola. The flour burned out, made the clay more friable and facilitated removal. Later we discovered that sawdust from the pattern shop is a more satisfactory component and costs absolutely nothing.

2. Foundrymen who buy mobile equipment usually insist on iron wheels or solid tires, to prevent possible accident while rolling through spilled metal on the floor. In our experience with pneumatic tires we have had no trouble from this cause. Our sulky ladle has transported many tons of iron on ball bearing wheelbarrow wheels without tire replacement. Extra softness of the tires has been well worth while in preventing spills at high speed. Certainly iron never is spilled deliberately on the floor, but when it does happen the buggy ladle is driven through it as fast as possible.

3. Our cupola charge is 100 per cent scrap. We have had no (well, almost no) trouble with hard castings. They are not as soft as the traditional butter, but they are perfectly machinable in rigid and well maintained machine tools. Brinell varies between 187 and 229, depending on the service and the section thickness. The scrap is selected intelligently and carefully. We add necessary amounts of ferrosilicon and ferromanganese, and some soda ash to lower the sulphur content.

WILHELM BAUM
Wilhelm Baum Machine Works
South Haven, Mich.

* * *

Cup, Saucer and Spoon

TO THE EDITORS:

While reading the May issue of FOUNDRY I noted with interest the article on "The Cup and Saucer and Spoon." Having had considerable favorable and unfavorable experience in the production of these castings, I want to say you really have covered the subject in a complete and satisfactory manner. In your article you featured a three-part flask. I used a two-part flask. I also have made several castings in a slip jacket.

The job is considerably more difficult in a two-part flask and I succeeded only after several trials. Afterward I wanted to try a new angle. This proved to be a real job, and I had no peace of mind until finally I succeeded. I regret that I have not the ability to write a description or to present sketches of how to make the cup, saucer and spoon in a two-part flask. Perhaps some day some person with the necessary skill will describe the two-part mold as well as you did with the three-part flask.

After serving an apprenticeship of four years and working as a journeyman molder for one year I was recalled to the Navy where I am now in the foundry department of a repair ship.

JACOB F. HOUCK
U. S. Navy
Fleet P. O., San Francisco

* * *

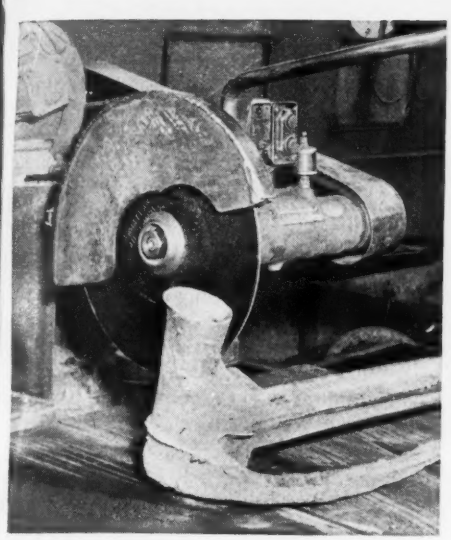
Curing Leaking Cylinders

TO THE EDITORS:

In the June issue of FOUNDRY under "Questions and Answers"—"Cast Cylinders in Green Sand"—mention is made of the usual cause of leaking cylinders being improperly made cores or those which cause boiling or the eruption of sand patches.

Even with well made cores which are properly vented, I find that cylin-

(*Concluded on page* 68)



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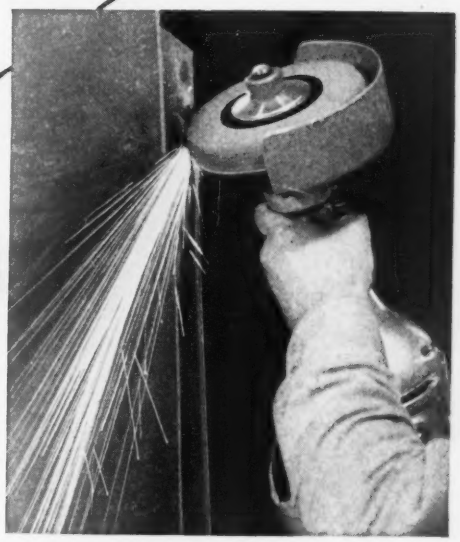

The greatly increased strength of MANHATTAN Reinforced Foundry Cut-off Wheels enables them to withstand the severe strains imposed by foundry cutting.

With his greater confidence in the safety of these wheels, the operator works more vigorously instead of "babying" the wheel. This results in higher production and lower costs.

Manhattan Abrasive Wheels for portable grinders are engineered for the job. They satisfy workers on incentive pay who want high grinding speeds. They satisfy management men who want good quality production and lower costs.

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FAMOUS "Milwaukee thread stem" design has been skillfully engineered to permit the use of a heavier stem to insure proper core support without sacrificing fusibility. If you are working with pressure type precision castings, Milwaukee Chaplets are a "must" for improved production, fewer rejects, and all around excellence in quality.

Write for Samples and Prices.

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(*Concluded from page* 66)

ders tend to leak from one or more of the following causes:

a. Dirty metal poured into the mold cavity.

b. Slight boiling over the core during pouring, and

c. A collection of dirty metal along the top of the horizontally poured cylinder.

To overcome these influences, I have found the following measures to be effective:

1. Clean metal into the mold cavity. This can be accomplished by knife gates taken from the bottom of a runner or other suitable gate design.

2. Pouring rapidly so that the mold cavity is filled and enough liquid pressure is developed before the core generates gas. This liquid pressure then forces the core gases to move through the core vents, instead of blowing into the metal.

3. Rectangular vents set at intervals of 6 in. to 8 in. through the cope along the top of the cylinder and opening into the pocket at the top of the cope are recommended. This will permit the dirty metal, which always collects at the top of the cylinder, to be drained off into the pockets. These vents also prevent back pressure no matter how rapidly the casting is poured.

FREDERICK G. SEFING
Development and Research Division
International Nickel Co. Inc.
67 Wall St.
New York 5

* * *

Thanks from England

TO THE EDITORS:

I should like to ask you, through the medium of your paper, to give my kind regards to all those foundrymen who did their utmost to make the visit of my colleagues and myself such a happy one during our brief stay in your country.

W. L. HARDY
Foundry Manager
Lake & Elliot Ltd.
Braintree, Essex
England

* * *

Likes the Cover

TO THE EDITORS:

Congratulations on your new cover, as we feel it will be a great asset to your magazine and increase its position in the publication field.

A good step in the right direction and we want to congratulate and compliment you on your efforts.

CLYDE A. SANDERS
Vice President
American Colloid Co.
Merchandise Mart Plaza
Chicago 54

Powder-Cutting

Steps Up Production of Stainless Steel Castings 32 Times . . .

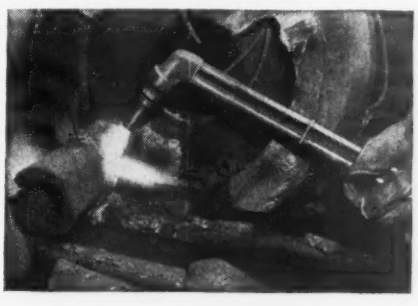
Riser cutting of centrifugally-cast stainless steel rings used to be a difficult and time-consuming job. In one foundry which used a boring machine, this operation took eight hours per casting. When powder-cutting was introduced, the time was reduced to approximately 15 minutes—a 32-fold increase in production.

In another foundry, powder-cutting was profitably used to remove ⅜ to 1 in. of metal from stainless steel castings. The machining cost for this type of work has been $24.00 per casting. Substitution of powder-cutting brought the overall cost, including finish-grinding and chipping, to $7.53 per casting, and reduced the time from 8 hours to 1 hour. For an order of 60 castings, the foundry saved $988.20 and 360 hours of operating time.

. If you have stainless steel or other oxidation-resistant metals to cut,

Centrifugally-cast rings of stainless steel are cut in 15 minutes time, increasing production 32 times.

LINDE's service engineers can show you how powder-cutting methods can be used with profit. Phone or write the nearest LINDE office.



Here, risers on stainless steel castings are being powder-cut—a time saving of 30 per cent over the former methods.

LINDE AIR PRODUCTS COMPANY

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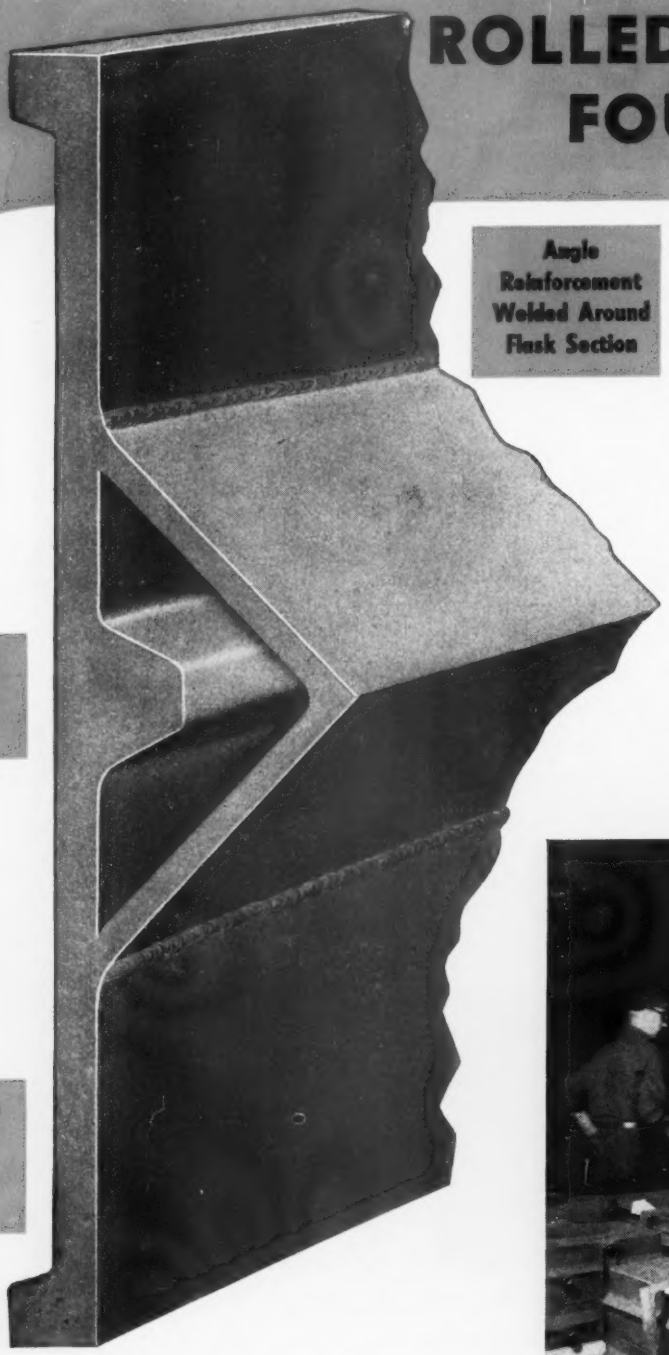
Angle Reinforcement Welded Around Flask Section
Solid Rolled Reinforcing Rib
Heavy Square Flanges with Full-Width Bearing

Flanges permit accurate machine finish and cannot curl under jolt action. They contain sufficient stock to allow re-machining several times.

When you specify Sterling Flasks, you get the very best that money can buy. For Sterlings are backed by almost a half century of "know-how" in fabricating precision-built foundry flasks. Sterling pioneered and perfected the famous ROLLED STEEL CHANNEL construction, long proven superior under rough foundry usage. That's why, today, you will find Sterlings in more than 4500 foundries.

STERLING WHEELBARROW COMPANY
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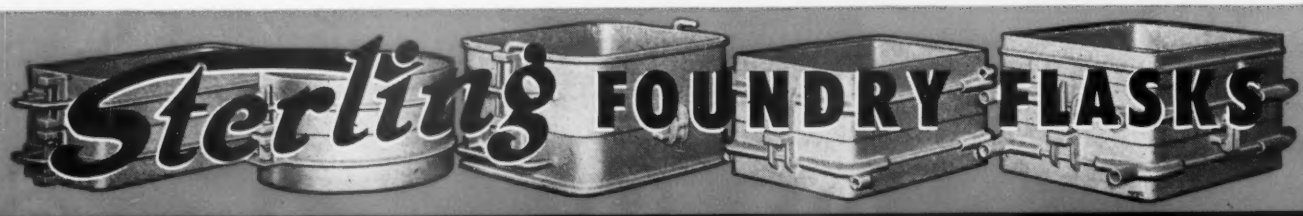


Foundries Need Scrap Too

SCRAP has become the commodity of first importance in the defense program. Phenomenal demands for metallics have brought estimated scrap needs far beyond consumption during the heaviest production year of World War II. Original estimates placed ferrous scrap requirements for 1951 at 32,500,000 tons, but the report on January consumption caused the total to be increased to 36,500,000 tons. If the ferrous metal industries are to get through the winter, when scrap collections drop, a total of 38,000,000 tons will be required. Considering the fact that the year of peak production during the war required only 24,500,000 tons of scrap and consumption in 1950 was 29,500,000 tons, present needs are stupendous. Foundry requirements for 1951 will exceed 10,000,000 tons.

Therefore, every foundryman producing ferrous castings should be vitally interested in the scrap drive now being conducted by the NPA to seek out dormant scrap and place it in normal channels as soon as possible. Active participation in the program should be regarded as essential to the future operation of each foundry. One trade association has suggested each individual foundry operator can participate in the following ways:

1. Clean up and use dormant scrap in your own foundry, including obsolete machinery and equipment.

2. Have salesmen urge customers to take similar action and have their scrap marketed immediately through regular scrap channels.

3. Lend assistance to scrap committees being formed by many local Chambers of Commerce and other civic organizations.

4. Make the activity in getting out scrap a permanent, top management responsibility. Increased production by all types of ferrous foundries and expansion in steel mill facilities will require an increased flow of scrap.

However, if foundries are to secure their fair share of scrap in order to pour the castings required for defense, defense supporting and essential civilian production, the NPA and other groups in the scrap drive will have to do more than pay lip service to the importance and the needs of the foundry industry. While foundries are mentioned in most of the publicity on the drive, practically all of the detailed data on needs is devoted to rolled steel. A horrible example of this type of slight is found in the booklet, "Scrap for Steel for Defense," published by NPA.

With CMP indicating that scrap is to be allocated, the foundry industry should be placed in position to advise NPA on requirements. Since Greene of American Iron & Steel Institute is a consultant to the Iron and Steel Scrap Section of NPA, and sits in on advisory committee meetings, it is only fair that NPA take immediate steps to provide representation for the ferrous foundry industry by appointing Donaldson of Steel Founders' Society, Ryan of Malleable Founders' Society or Workman of Gray Iron Founders' Society as a consultant to the Iron and Steel Scrap Section.

Frank G. Steinebach
Editor

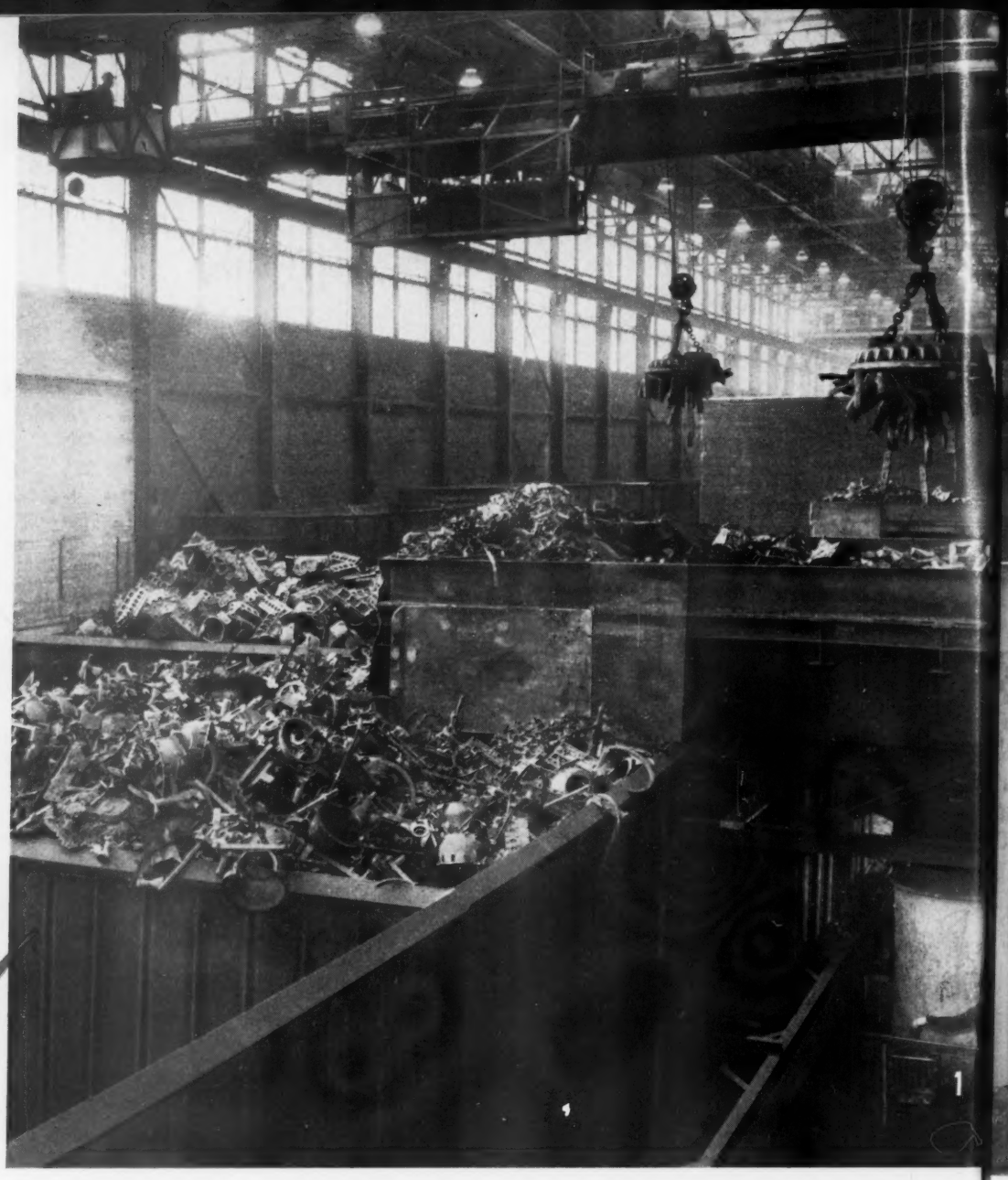


Fig. 1 — Weighed metal charge is dropped into a cupola charging bucket carried on a transfer car

STUDEBAKER Doubles Foundry C

This is the first of a series of articles describing how the Studebaker Corp. modernized its gray iron foundry and doubled the plant's productive capacity without suspending operations. The new facilities incorporate many of the latest developments in foundry equipment and in plant layout for efficient production. *See page 122 for identification of the men shown on the cover*

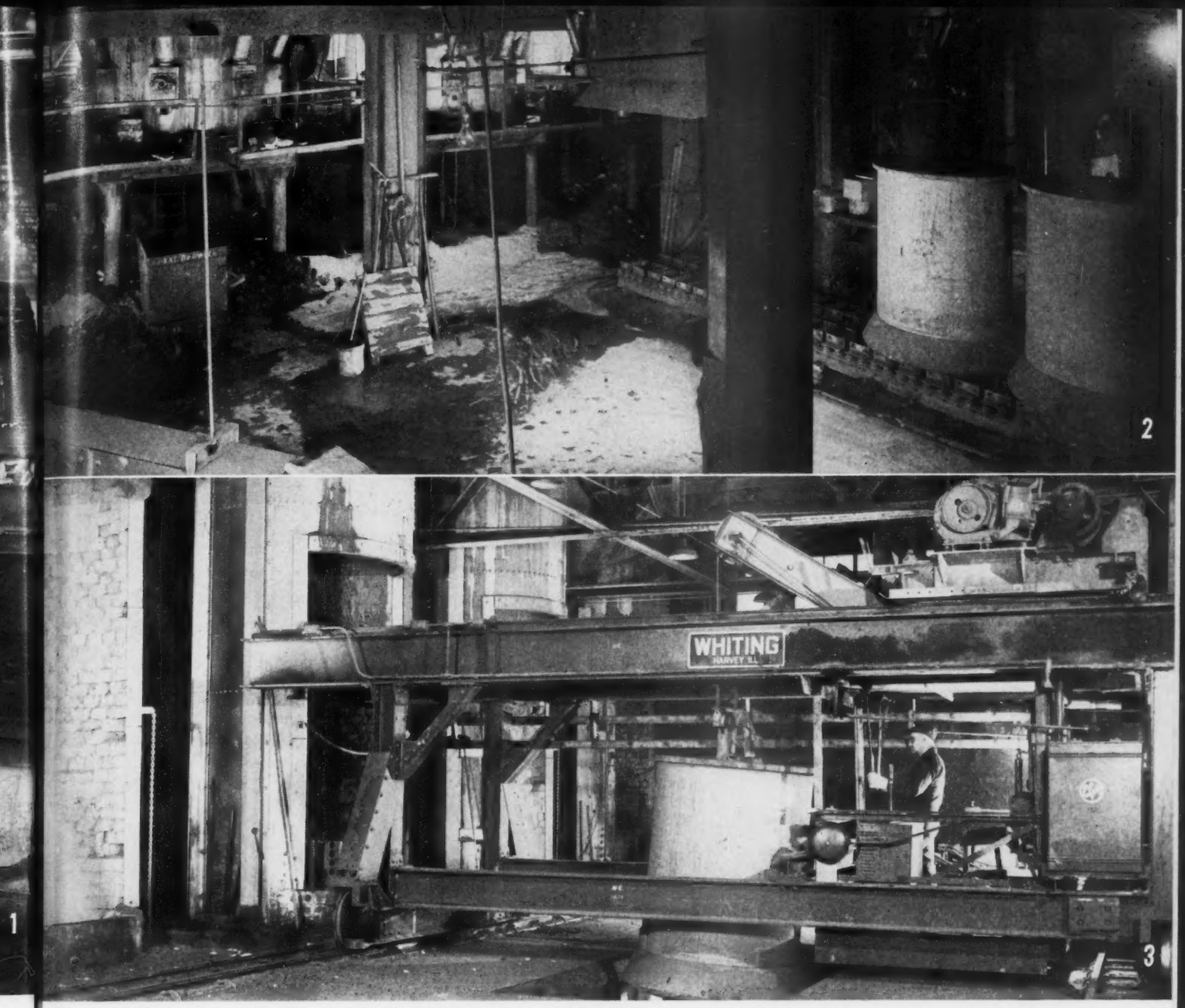


Fig. 2—Charging buckets roll by gravity to a pick-up position under the charging bucket well

Fig. 3—Gantry crane operates in low headroom at charging floor in handling charging buckets

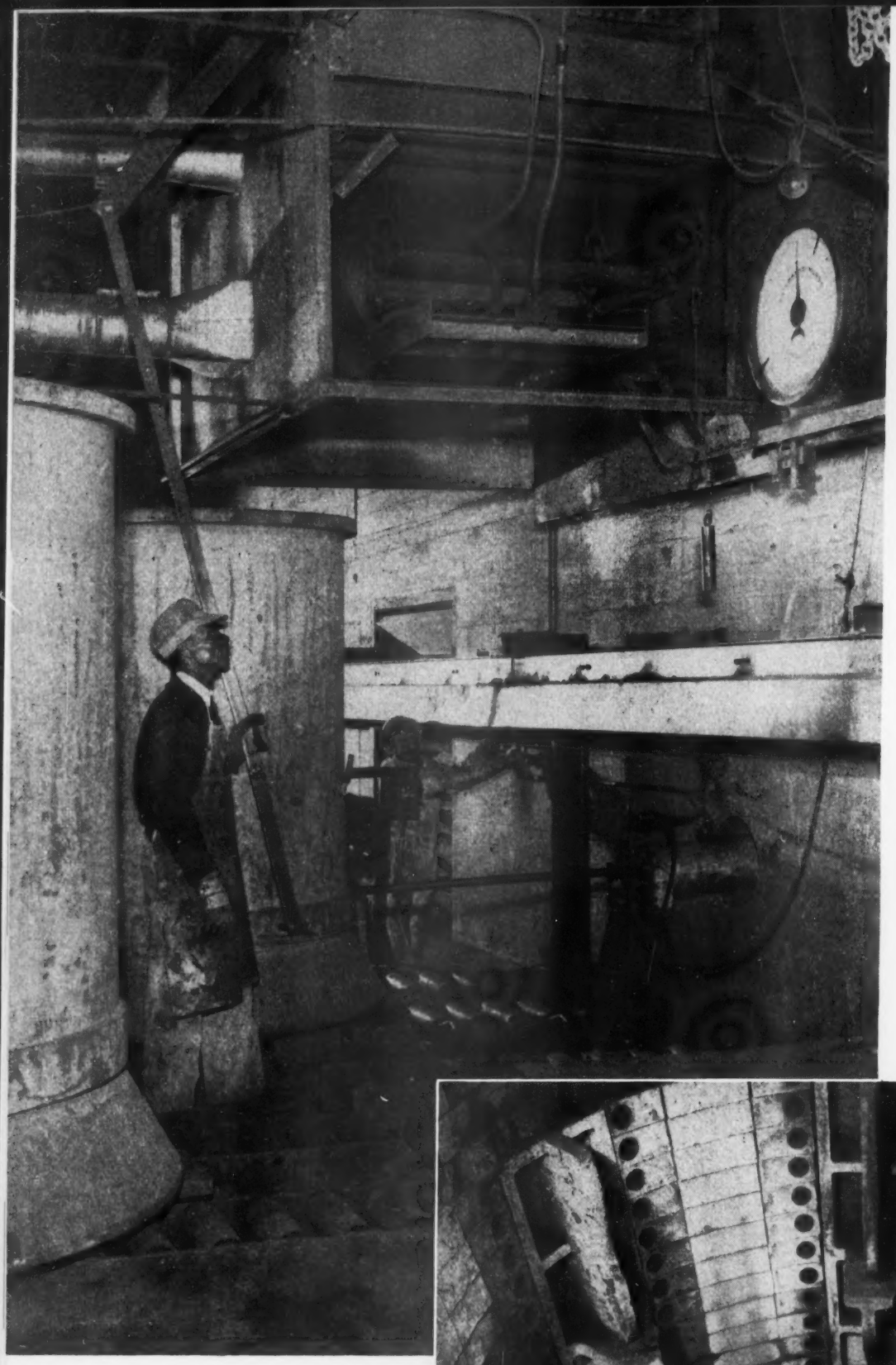
Capacity

By RAY H. MOORE
Consulting Engineer
Claude B. Schneible Co.
Detroit

GROWING demand for castings and a radical new passenger car engine design required the Studebaker Corp., South Bend, Ind., to produce 400 tons of automotive gray iron castings daily in a foundry which had been under pressure to produce 200 tons a day. It was also necessary to maintain operations and increase production throughout the expansion and retooling program.

The foundry superintendent, Emil G. Schmidt, is well experienced in the operation of highly mechanized foundries and had supervised the planning and installation of mechanical equipment in two new foundries. However, to tool up for the new V-8 engine, modernize the existing Studebaker foundry, train operators for new production methods—and at the same time avoid shutting down operations—put the entire foundry organization to an extreme test.

With the help of outside consulting engineering



Doubles Foundry Capacity

Fig. 4—Charging bucket is pushed off transfer car pneumatically onto roller conveyor leading to charging bucket well

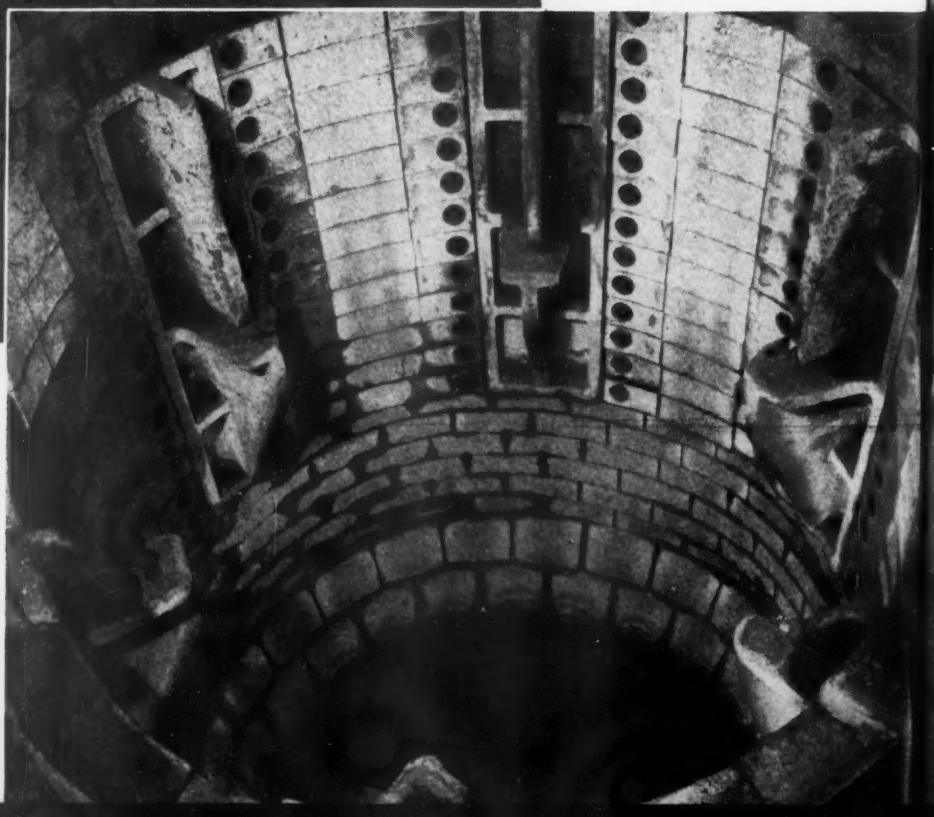


Fig. 5 — Lugs projecting into cupola open charging bucket when it is lowered and guide cone bottom into shell for removal of empty bucket

services, a foundry engineering department was organized under the direction of Mr. Schmidt, who did the overall planning of methods, equipment and organization. Electrical engineer James Devoir supervised the design and installation of all control equipment as well as the foundry maintenance department. Mechanical engineer John H. Kauffman and his assistant, William F. Hope, supervised plant layouts and equipment details and devised new units of equipment where specific requirements could not be met otherwise.

Pattern supervisor Louis Smanda and trouble shooter John Payleitner organized the pattern equipment and rigging for the new V-8 engine. P. C. Waldron supervised purchase requisitions and controlled expenditures against appropriation allowances. Departmental general foremen—R. C. Bopes, melting; H. A. Graber, cleaning room; Earl Bradley and Emery Soos, coreroom—played a vital part in the expansion program in their departments, especially in the installation of new equipment without interrupting production.

The character and design of new equipment was strongly influenced by existing facilities and the necessity for changeover without sacrifice of current production.

This modernization program is not completed but production requirements have been met, man-hours per ton have been reduced and working conditions have been materially improved. Previous bottlenecks have been eliminated. When further increase of production is required or changes in engine design are made, new bottlenecks are anticipated and plans have already been developed for these contingencies.

The main foundry building is 720 x 400 ft. The material storage building is 720 x 75 ft and the cleaning room is 660 x 204 ft. Six No. 9½ cupolas supply iron for seven conveyorized molding units and a small parts floor. Up to 300 tons of cores per day are baked in four large horizontal core ovens and six large vertical ovens.

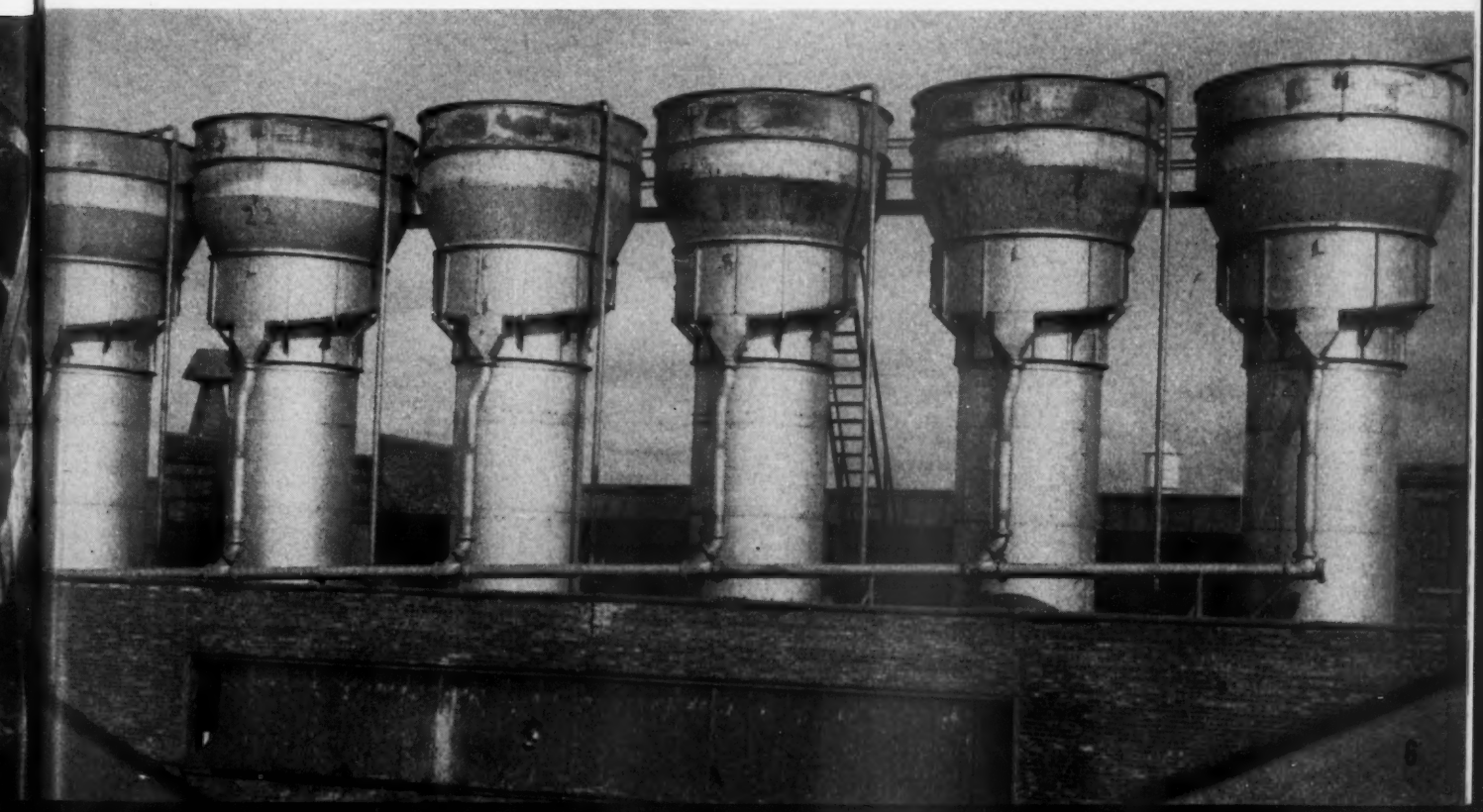
The following description of the Studebaker foundry will carry through from receiving the raw material to the finished casting ready for the machine shop and will cover present operations without reference to the old methods. Unique material handling methods, effective dust and fume control and building ventilation balance will be explained.

Material Storage and Melting Department—Melting stock, coke, stone and all refuse are stored in the 720 x 75 ft enclosed materials bay, which has 50-ft clear height under trusses. A railroad switch track 10 ft above floor level enters this building at one end and extends its full length along the outside wall. A crane runway, 43½ ft above floor level, carries two three-motor cranes with 65-in. magnets and two five-motor cranes each equipped with a 2-cu-yd bucket and a 10-ton hook for magnet or other lifting.

Sand is received in cars on the elevated track and is unloaded by bucket crane which delivers the currently used sand to a surge bin feeding the sand drier. If the sand is to be stored for subsequent use, the bucket crane delivers it to one of eight concrete sand storage bins ranging in capacity from 1500 to 2500 tons each. Some sand is received in hopper bottom cars from which it is dumped into four large storage compartments under the track. A shovel truck and bucket elevator deliver this sand to the above-ground bins for crane handling when it is needed. The total reserve sand storage capacity is about 20,000 tons.

Melting stock storage consists of 16 bins approximately 20 x 20 x 12 ft deep made of interlocking steel piling driven into the ground 8 ft and extending 12 ft above ground. All corners and partition intersections were fabricated before driving. The top ex-

Fig. 6—Water curtain cupola collectors keep roof clean, prevent dust dispersion into neighborhood



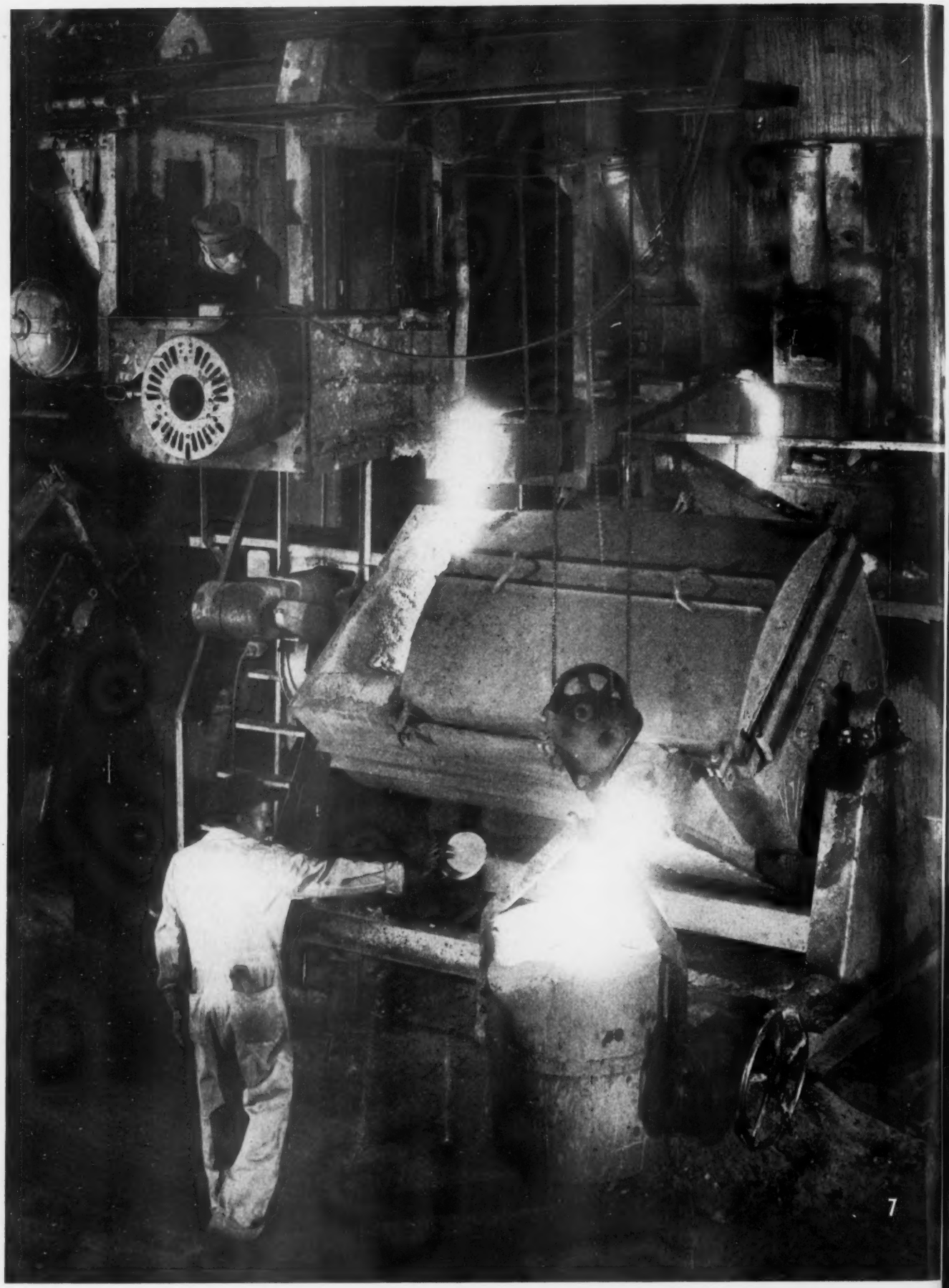


Fig. 7—Front slagging spouts drain slag from cupolas into a common sluice

Fig. 8—Slag and cinders are sluiced to a central refuse tank for disposal

posed edge of all walls and partitions is capped with two 6 x 4 x ½-in. angles with the toes of the 6-in. legs welded together and the toes of the 4-in. legs welded to the steel piles. This provides a stiffener for the top of the walls that presents a glancing surface to the magnet and will not catch and be pulled off. These bins provide storage capacity for 5000 to 8000 tons of melting stock, depending on its density.

Two 20 x 30-ft elevated charge makeup platforms are nested into the metal storage bins and extend over a transfer car track. A scale hopper is suspended from the charge make-up platform over the center of the transfer car track. The scale dial is mounted on the wall high above the make-up platform in clear view of the magnet crane operator. The charges can be made up of metal taken directly from the railroad cars or from the metal storage bins. A weight recording device is operated by pushbutton in the crane cab for each increment of the charge when weighed.

On each trip out the crane operator brings back all of the iron that the 65-in. magnet will carry and drops the required amount for the charge into the scale hopper, then deposits any left on the magnet into its pile on the make-up platform close to the scale hopper. When time is short he uses the stock on the make-up platform for the charge and when the charge is completely weighed up he busies himself unloading cars into metal storage bins or replenishing the stock on the make-up platform from cars or bins. All operations involved in making up a charge and keeping cars unloaded can be accomplished in three to four minutes per charge. Very accurate trimming of charge weights is accomplished by experienced operators and no manual trimming is necessary even on the small increments of silvery pig. A reverse polarity magnet controller is essential to delicate weight control.

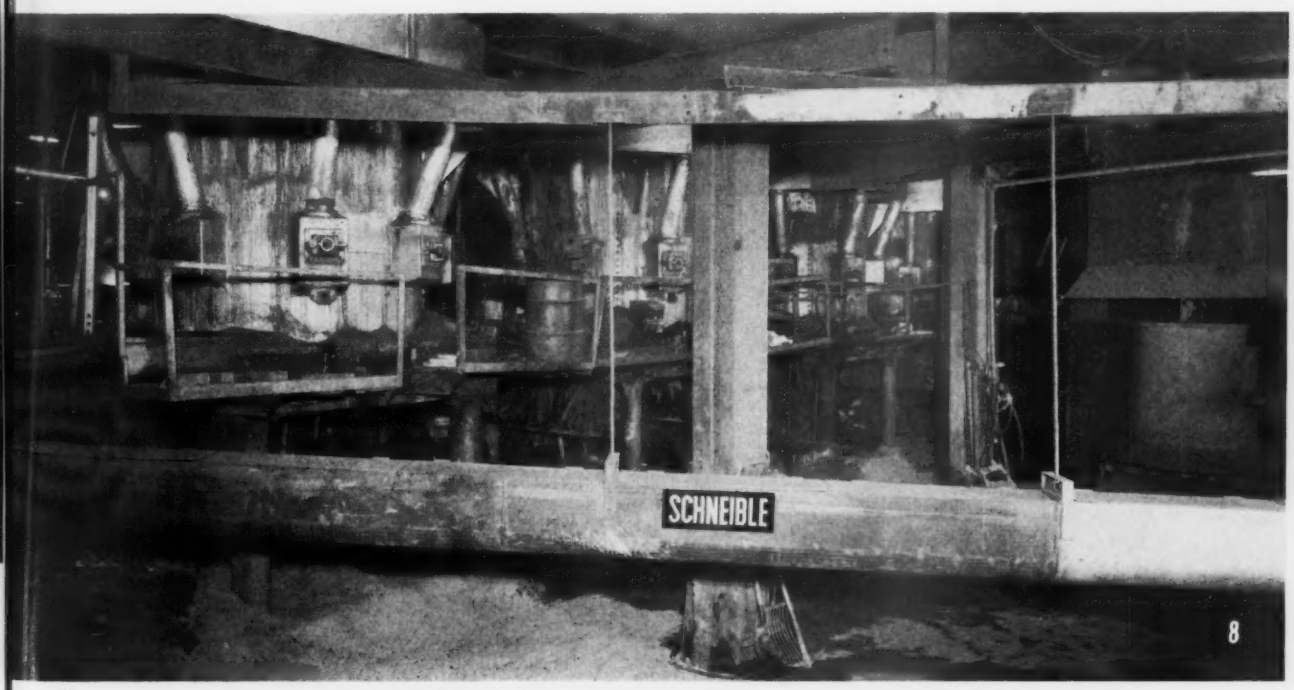
The two 4000-pound metal charges are dropped into

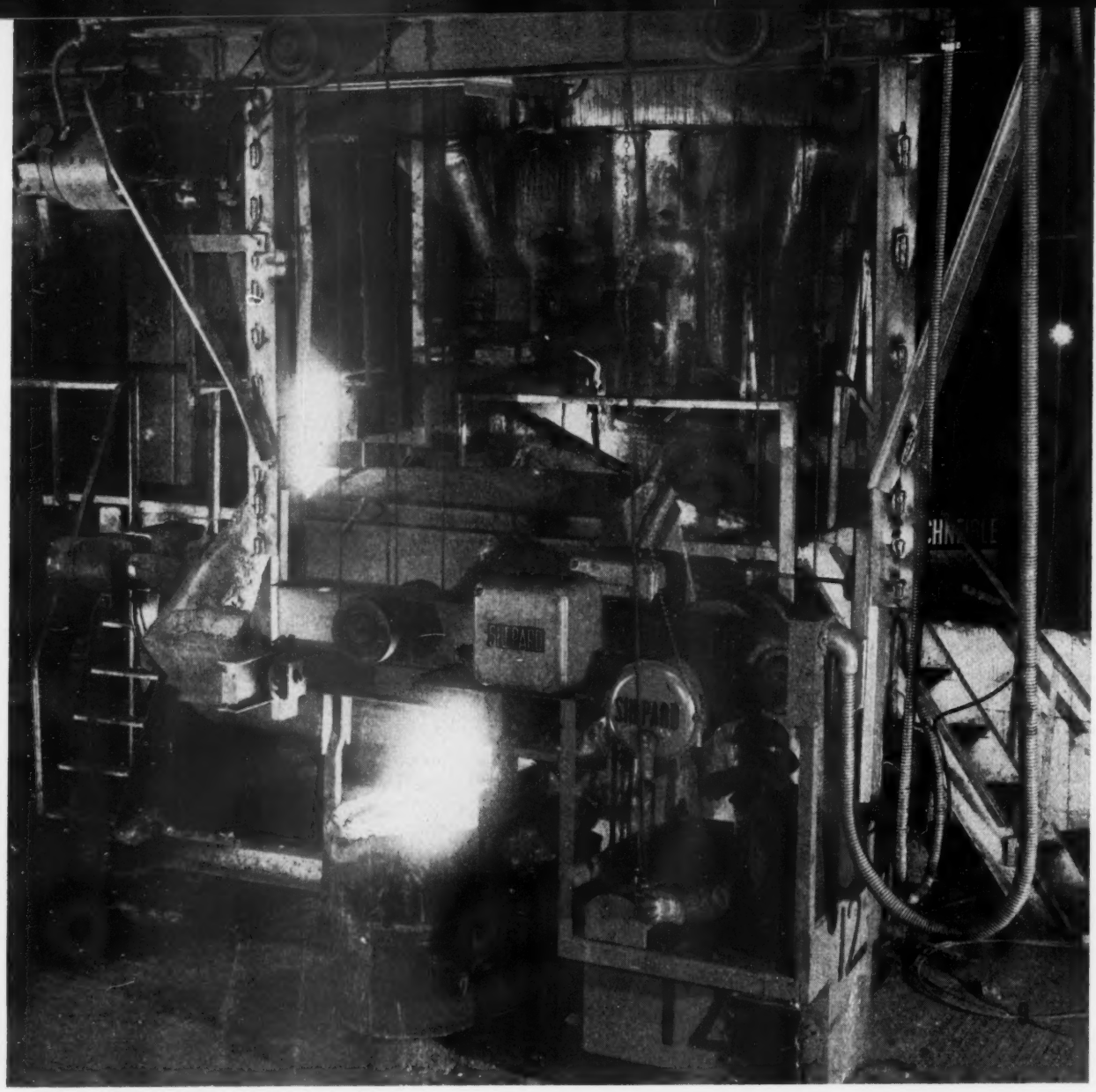
Doubles Foundry Capacity

two cone bottom cupola charging buckets carried on a transfer car (Fig. 1) which delivers them to a roller conveyor running at right angles to the transfer car track in back of the cupolas. There is a large bin for storage of 12 carloads of coke and one for four cars of limestone for reserve supply. Current-use coke and stone are delivered direct from cars on the switch track to overhead bins by bucket cranes. These bins have storage capacities for one and a half carloads of coke and one and a half carloads of limestone. A suspended weigh hopper receives and weighs the coke and stone for each charge and discharges it directly into the cupola charging bucket which has previously received the iron charge.

The bucket is then pushed off the transfer car onto the roller conveyor by a pneumatic pusher (Fig. 4) and advances along the pitched roller conveyor to a position under a charging bucket well (Fig. 2) extending to the charging floor. A safety hook that cannot let go is manually set on the eye of the bucket stem and the loaded bucket is hoisted to the charging floor by a gantry charging crane (Fig. 3).

The charging crane is then aligned with one of the three operating cupolas and its extending trolley boom moves the bucket into the cupola, lowering it until a wide flange on the bottom of the bucket shell settles squarely onto six heavy cast iron lugs projecting into the cupola (Fig. 5). This stops the lowering of the bucket shell but the cone bottom and the charge within the bucket continue to descend,





Doubles Foundry Capacity

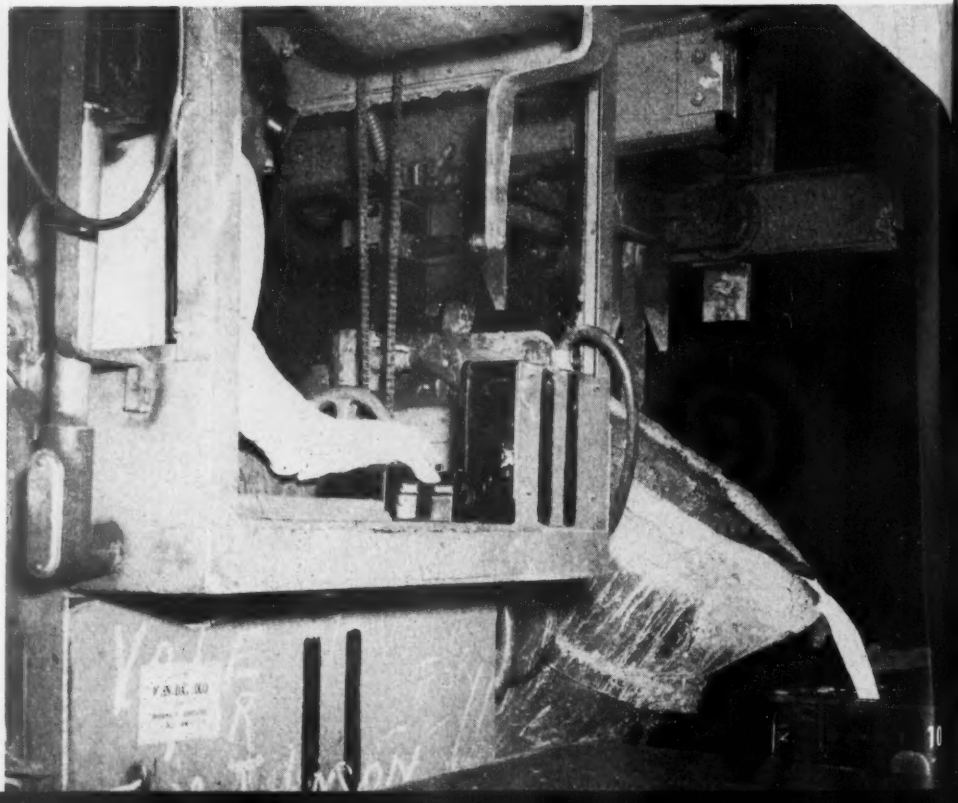


Fig. 10 — Duplicate ladle tilting control switches permit pouring molds on either side of the telpher cranes

g. 9—Hot metal monorail telpher cranes are quipped with heat-resisting shatter-proof glass

opening the bottom of the bucket and spilling the charge into the cupola over the cone. The cone bottom, being suspended by its stem from the crane hook, is free to swing so that the large chunks in the charge can push the cone aside and drop freely into the cupola.

As the cone bottom is hoisted out of the lower position in the cupola it is centered by guiding ribs on the six lugs and enters the bucket shell squarely, thus engaging the shell, and the entire empty bucket is lifted off the lugs and withdrawn from the cupola. The gantry charging crane then registers with the charging bucket well over an empty bucket roller conveyor which is pitched toward the transfer car track for return of the empty bucket to the transfer car by gravity.

Six No. 9½ cupolas lined to 60-in. inside diameter are employed. They are piped to the blowers in pairs to be run on alternate days for two eight-hour shifts. Each of the cupolas is equipped with a water curtain cupola collector (Fig. 6) and a complete sluicing and water recirculating system. The blast air is supplied by three air-weight control, centrifugal cupola blowers; a fourth blower is set up in readiness and so piped that it can take over for any of the three blowers that might fail. Each cupola is equipped with a front slagging spout that continuously drains the slag into a common sluice passing all cupolas. A U-shaped, motor-tilted, covered reservoir ladle of 12,000-pound capacity is mounted before each cupola (Fig. 7) so that it can be removed with two fork lift trucks for major repairs and replaced with the spare ladle. The tilting motors are operated by pendant switches under the control of the operators of the hot metal monorail cranes.

Five new hot metal monorail cranes are of the telpher construction in which the cab raises and lowers with the ladle so that the crane operator does the pouring. These cranes (Figs. 9-10) are equipped with stabilizer outrigger wheels which engage outrigger rails at the pouring zones and permit lateral movement of the ladle 8½ in. from the centerline of the monorail in both directions. A motor-operated ladle tilting bracket is under duplicate control on both sides of the cab and a heat resisting shatterproof glass shield protects the operator.

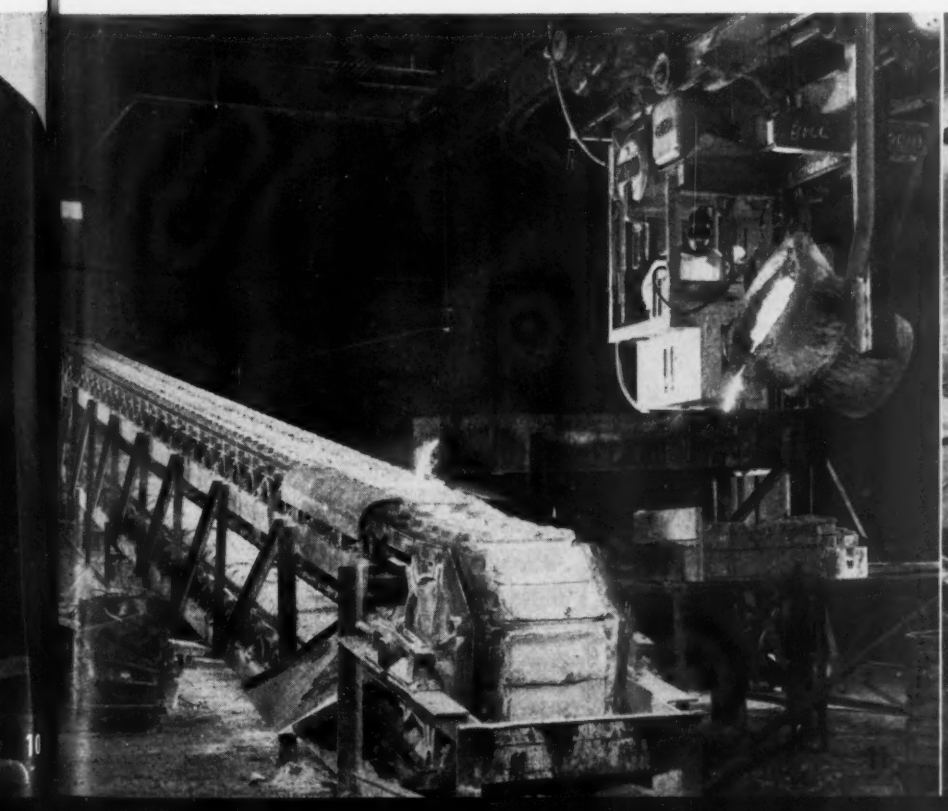
There are two separate travel drives, one for high speed to and from the cupolas, and one low-speed drive with a five-speed controller and a rheostat between controller points for infinite speed regulation. The low speed is set to the speed of the conveyor line being served. A foot pedal throws out the high-speed drive and engages the preset low-speed drive; thus the operator travels to and from the cupola at normal monorail travel speeds and locates at the pouring position of the mold on the conveyor. He then depresses the foot pedal and the pouring spout holds its relation to the mold until he shifts to the next mold on high speed. While pouring a mold he has his high-speed controller lever in "off" position so if the mold conveyor stops he merely releases the foot pedal and his crane also stops.

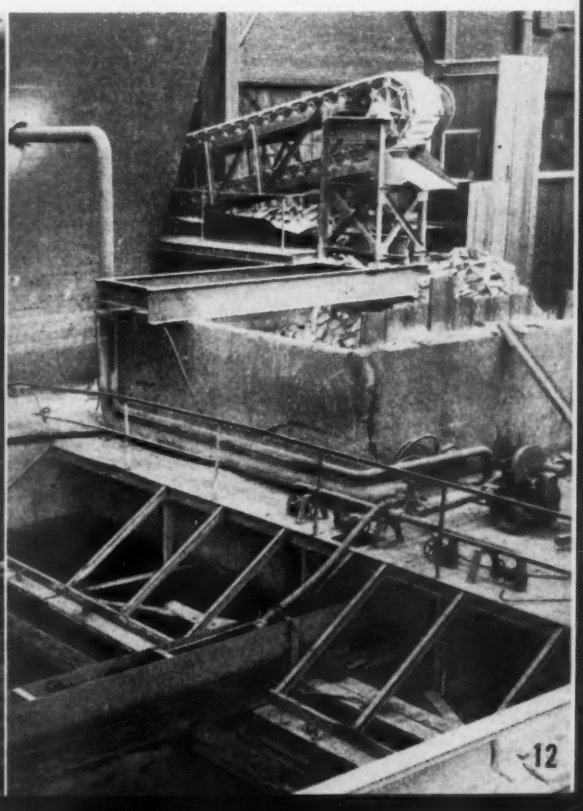
A blast furnace type pigging machine (Fig. 11) is so located that it can be served by any of the hot metal monorail cranes for disposal of over iron or cold iron. The pigged iron is discharged from the machine into a bin in the material storage bay (Fig. 12) and is magnet handled to the cupola charge make-up area.

(To be continued next month)

Fig. 11—Over iron or cold iron is disposed of by a pigging machine served by hot metal cranes

Fig. 12—Delivering pigged iron into a storage bin





Control of Foundry Scrap

By A. M. ATWATER
Assistant Division Auditor
Foundry Division
Blaw-Knox Co., Pittsburgh

JOB COST CARD — Order No. 2064

Customer: Acme Manufacturing Company
Description: Base
Quantity: 2
Pattern No. 26132A

	Hours or Pounds	Rate	Amount
Mold - Direct Labor	60 Hr.	$1.90	$ 114.00
Mold - Overhead	60 Hr.	2.00	120.00
Core - Direct Labor	40 Hr.	2.00	80.00
Core - Overhead	40 Hr.	1.50	60.00
Raw Materials	30,000 #	.008	1,204.00
Melting	24 Hr.	2.50	240.00
Cleaning			60.00
Other			
Total Cost			$1,678.00
Less: Salvage value of scrap castings			103.20
Net Job Cost			$1,774.80
Less: Net Scrap casting cost			522.80
Cost of Good Castings produced			$1,252.00

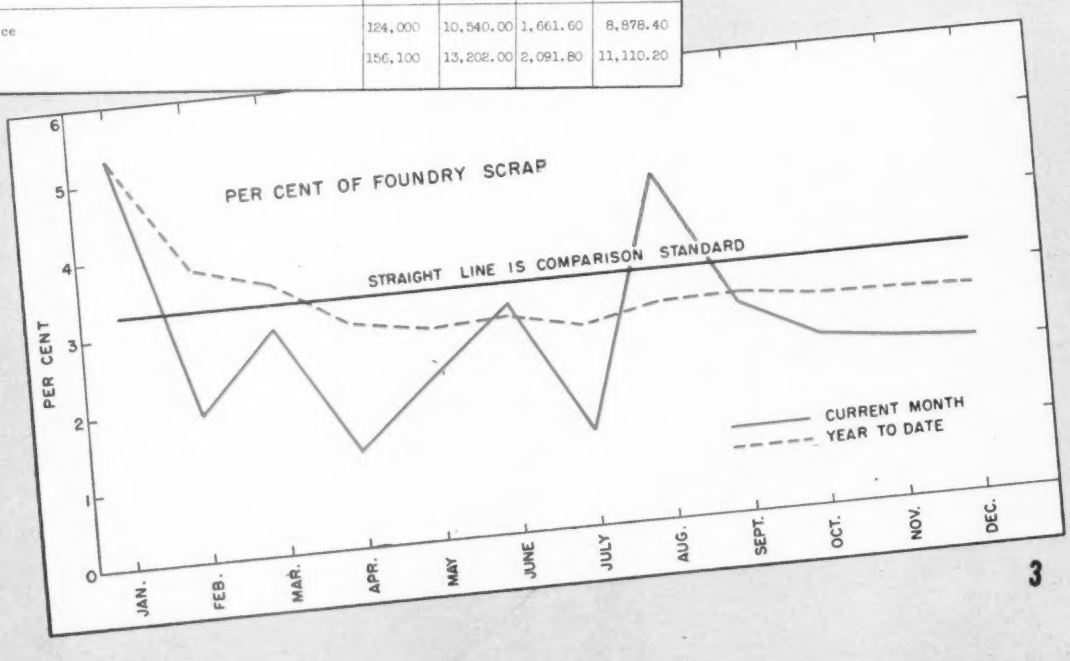
Casting Date	Casting No.	Rough Weight	Shipment or Scrap Record	Cost	Salvage Value	Net Cost
8-18-49	8062	7,640#	9-2-49	$626.00	$103.20	$ 522.80
8-20-49	8063	7,700#	Scrapped 8-22-49 a/c Porosity			
8-25-49	8063A	7,760#	9-2-49			

1

CASTINGS SCRAPPED IN PRODUCTION
MONTH OF AUGUST 1950

Order No.	Catg. No.	Date Cast	Description	Defect	Weight	Cost	Salvage Value	Net Cost
2053	7920	8-10	Gear Cast Cover	External Crack	2,240	220.00	30.00	190.00
2064	8063	8-20	Base	Porosity	7,700	626.00	103.20	522.80
2083	8094	8-22	Housing	Excessive shrinkage	20,000	1,600.00	268.00	1,332.00
2092	8106	8-24	Spindle	Blow Holes	2,160	216.00	29.00	187.00
				Total	32,100	2,662.00	430.20	2,231.80
Previous Balance					124,000	10,540.00	1,661.60	8,878.40
Year to Date					156,100	13,202.00	2,091.80	11,110.20

2



3

This description of how to check the effect of scrap castings on the profit from each job, and how to summarize scrap performance monthly, is from the December, 1950, issue of the N.A.C.A. Bulletin, published by the National Association of Cost Accountants

THE foundry that can produce castings without rejections due to defects is still a figment of the imagination. However, excessive amounts of scrap cause serious inroads on a company's profits. Even more serious may be the resulting loss in production as schedules are continually revised, necessitating the relegation of oncoming production to later dates.

The problem of the accountant is to ascertain the significance of the foundry's scrap cost and to establish the proper statistical reporting to aid foundry management in the control of defective casting cost. In some systems scrap cost is treated as overhead which is distributed on a percentage basis or included in a burden rate for cost dispersal. This method has a tendency to bury the extra scrap expense and give a fictitious job cost. On the job cost summary under such a method, orders without scrap are penalized and orders with scrap are favored in respect to job profit. A more efficient and effective means of accounting for defective castings in a job cost system may be obtained through special treatment of scrap results on each job.

Job Profit and Loss—In this type of system, historical information is available on the job card showing whether previous orders were produced with a normal, subnormal or excessive amount of scrap. In a case where scrap cost is exceptionally high, further study may reveal that a particular casting assumes a greater risk in production than other types of castings. With this information the foundry manager is in a position to decide on a higher mark-up or to show a reluctance to quote on further similar orders. On the other hand, knowing the risk involved he may be able to devise improved methods of production which will eliminate a greater part of this risk.

The system may best be illustrated by a case example. To determine the cost of a defective casting, the job cost card (Fig. 1) should be so designed that a reasonably accurate defective casting cost can be obtained. The illustrative data given show that it was necessary to cast an additional base in addition to the two ordered, since one casting was declared defective due to porosity. Therefore, the scrap cost is computed to be one-third of the total cost of $1878 or $626, less the $103.20 salvage value of the casting. In other words, $522.80 represents the net scrap cost or the excess cost incurred in producing the order due to a defective casting.

On the job cost card two important amounts are represented by the "net job cost" and "cost of good castings." When these amounts are separately compared with the sales price of the order, the actual gross profit or loss is determined, along with a computed profit or loss amount which would apply if the order had not suffered extra scrap costs. The following example, using cost figures from Fig. 1, illustrates this comparison:

Sales price	$1,540.00	Sales price	$1,540.00
Net job cost	1,774.80	Cost of good castings	1,252.00
Loss	$ 234.80	Profit	$ 288.00

It becomes apparent, therefore, that the job sustained a loss of $234.80 instead of realizing a profit of $288, due to extra scrap cost.

Notification to the office of a scrap casting on this order is effected through a rejection ticket furnishing specific information, including order number, casting description and reasons for rejection. At the end of the accounting period, which in this case is the calendar month, all rejection reports are sorted by order number and entered on the report entitled "Castings Scrapped in Production" (Fig. 2). Of the items listed, the second carries on the example of Fig. 1.

The job cost cards are used for compiling both the value of the work-in-process inventory and the cost of sales for shipments in an accounting period. Work-in-process value represents the value of good castings. Consequently, it is necessary to charge cost of sales with the total cost of castings declared defective in the accounting period.

Scrap Up or Down?—A chart (Fig. 3) on which the per cent of scrap is plotted, furnishes an instant answer for the foundry manager on the question of whether scrap is increasing or decreasing. Hypothetical monthly totals and percentages of the sort which supply the information for this chart are listed below for purposes of illustration:

Month	Total Weight Melted, lb	Weight of Scrap Castings	Per Cent of Scrap—Current Month	Per Cent of Scrap—Cumulative
January	720,000	38,500	5.35%	5.35%
February	640,000	12,200	1.91	3.73
March	750,000	22,600	3.01	3.47
April	690,000	8,400	1.22	2.92
May	660,000	14,200	2.15	2.77
June	705,000	21,200	3.01	2.81
July	580,000	6,900	1.19	2.61
August	710,000	32,100	4.52	2.86
September	680,000	18,300	2.69	2.84
October	695,000	15,100	2.17	2.77
November	675,000	13,800	2.04	2.71
December	625,000	12,600	2.02	2.66
	8,130,000	215,960		

A straight line is drawn across the chart which may represent either scrap performance per cent for the previous year or a budget for the current year, whichever is used for comparison. The solid line represents current year percentages month by month and the broken line a cumulative or year-to-date per cent.

With basic reports and records available, further analyses and correlation may be compiled to focus emphasis on conditions which are inconsistent with good foundry practice. The task at hand now becomes one of classification and tabulation. The importance of a correctly defined defect designation which specifically places responsibility where it should

be and is clear in the description of the reason for the defect, cannot be over-emphasized. Ambiguity should be eliminated and, to effect this, a list of defects by common nomenclature is a useful tool.

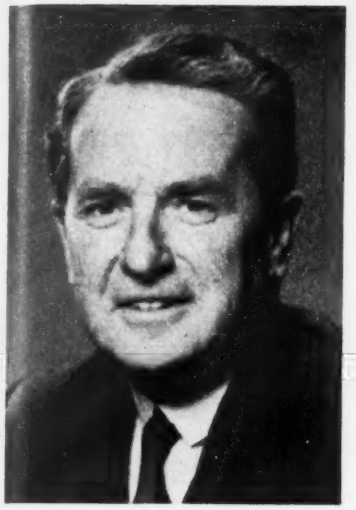
To compile this list, defect causes taken from prior rejection reports are listed. This list should be carefully reviewed with the various foundry technicians and supervisors so that uniform and descriptive defective casting reasons are agreed upon. With established defect classifications, tabulations by similar defects should be made in report form. Each defect report should be informative as to weight, net scrap cost and per cent represented in relation to total scrap over the applicable period. From these tabulations, frequency and cost importance of the several types of defects become very apparent. Insignificant scrap costs by specific defect may be by-passed and special attention directed to defects resulting in major portions of scrap cost over a recent period of time.

Incentive System for Foundry Workers—Undoubtedly the lure of additional compensation exerts a powerful driving force in the individual. We have seen in Fig. 2 the cost incurred in one month and also during the year to date, due to defective castings. The less tangible loss of production, with the resulting schedule revision and delay of on-coming production, is quite often overlooked. The cause of these losses may be that we are not getting the best work effort. The will to match previous performances is sometimes the limit of natural incentive. This will not cure our troubles. Many reasons for defective castings can be directly charged to continuing poor technique, improper supervision and plain carelessness. To counteract these factors, a properly installed and guarded incentive system will reduce scrap costs surprisingly.

As with any other incentive, extreme caution should be used in installing a foundry bonus system. The base may be either a scrap percentage goal or a maximum scrap cost amount. Using the latter, the saving due to lower scrap yields would be shared between the company and the employees participating in the bonus pool. With an incentive system, more rigid inspection of castings should be made before shipment. Collusion between the inspector and those receiving benefit from the bonus could result in the reporting of artificially low scrap costs, and if unsound castings were shipped to a customer, ill will would develop with the resulting loss of business. A heavy penalty should be assessed whenever the latter condition is evident. Full bonus adjustment granted on castings having passed inspection and having been shipped, is cause for suspicion and warrants a complete investigation.

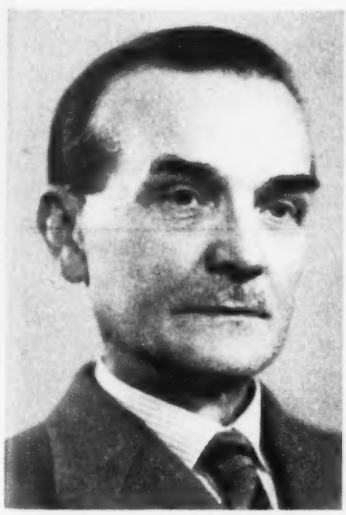
Stressing the Nation's Need for Scrap

NEED for a greater effort in the nationwide iron and steel scrap recovery program to avoid a possible lag in steel and castings production was urged by industry and government representatives at a recent meeting called by the National Production Authority. Among those attending the meeting were these men: Sitting, left to right— F. F. Aylesworth, Department of Agriculture; E. K. Moss, NPA director of public information; L. D. Greene, American Iron and Steel Institute; E. W. Greb, acting director, NPA Salvage Division. Standing —W. W. McMillen, National Malleable & Steel Castings Co.; H. P. Fowler, U. S. Chamber of Commerce; Herman Moskowitz, Schiavone-Bonomo Corp., and vice chairman of the Mobilization Committee for Iron and Steel Scrap; F. H. Hanfelder, American Steel Foundries; W. T. Hoyt, NPA Salvage Division; F. Kermit Donaldson, Steel Founders' Society of America; C. M. Brooks, NPA Steel Division; Robert Mossman, Jones & Laughlin Steel Corp.; F. A. Kellar, Chirurg Advertising Agency; S. J. Swanson, Institute of Scrap Iron and Steel; John Doxsey, American Steel Warehouse Association; C. C. Winter, Farm Equipment Institute.



COLIN GRESTY
President, IBF

DR. C. J. DADSWELL
Senior Vice President



E. LONGDEN
Junior Vice President

BRITISH FOUNDRYMEN

Hold 48th Annual Conference

By VINCENT DELPORT
European Manager
FOUNDRY

COLIN Gresty, new president of the Institute of British Foundrymen, has been associated for 39 years with the North Eastern Marine Engineering Co. (1938) Ltd., Wallsend-on-Tyne, and is now general foundry manager and chief metallurgist of the firm and its associated companies. It was, therefore, fitting that, after an interval of 19 years, the 48th annual conference of the institute should be held at Newcastle-on-Tyne, the center of a large industrial area, having many foundries in which are produced the thousands of tons of castings required yearly by the shipyards, engineering works and collieries in the district.

The convention, held June 13-15, opened with John Sheehan, the retiring president, in the chair. First event was the annual general business meeting of the institute. The annual report presented to the members disclosed a membership, as of Apr. 30, 1951, of 4773, compared with 4588 a year earlier. The report also showed increasing activities on the part of the institute, its 13 branches and 6 branch sections, its industrious Technical Council, and much good work in the educational field.

Following the report the president made the annual medal awards. Details of these awards are presented on page 192.

Diplomas of the institute were then awarded to:

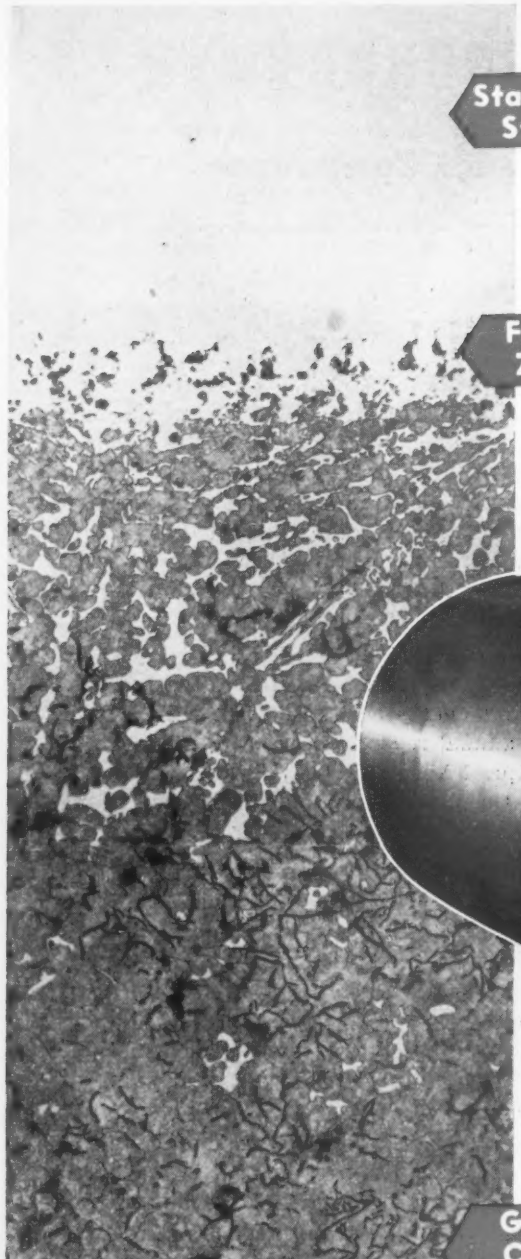
G. E. Fearfield, for his paper, "Core Blower Application and Operation," read before the East Midlands and Lancashire branches; K. H. Wright, for his paper, "Chill Roll Manufacture," read before the Birmingham branch; D. Redfern, for his paper, "Loam and Dry-Sand Moulding in the Jobbing Foundry," read before the Lancashire branch; Dr. E. Scheuer, for his paper, "History and Development of Aluminum-Silicon Alloys;" M. M. Hallett, for his paper, "Practical Experiences in Producing Nodular Cast Iron," read before the London branch; J. Currie, for his paper "Intricate Castings from a Durable Loam Mold," read before the Scottish branch.

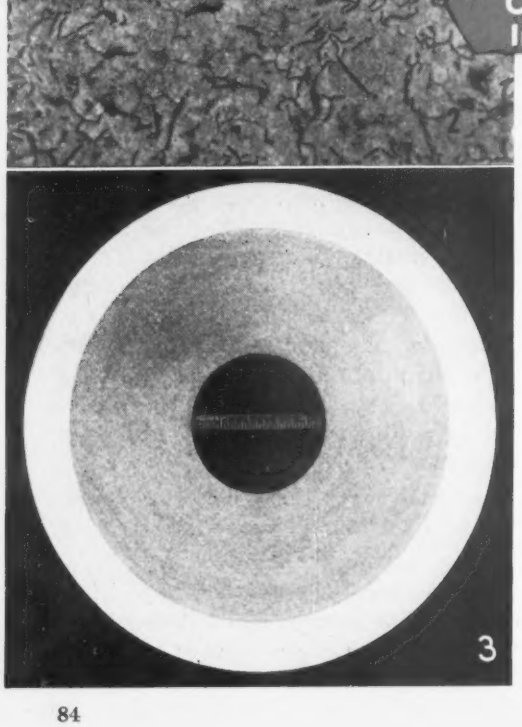
The meeting then proceeded to the election of its officers for 1951-52. Colin Gresty was unanimously acclaimed as president, on the proposal of the retiring president, John Sheehan, seconded by C. Lashly, president of the Newcastle branch.

Past President N. P. Newman proposed, and J. G. Bailes, president of the Sheffield branch, seconded the election as senior vice president of Dr. C. J. Dadswell, director of English Steel Corp. Ltd., where he is in charge of sales and production of forgings, steel castings and springs. Past President V. C. Faulkner proposed, and C. R. Van der Ben, president of the Lancashire branch, seconded the election of E. Longden, foundry consultant, as junior vice president. Mr. Longden has had considerable foundry experience in both practical capacities and in research work. An IBF medalist and a past branch president, he has served on the institute's General Council and its committees since 1926. He authored the IBF exchange paper to the AFS annual meeting in 1948.

The result of the election of five members to the Council of the institute was as follows: L. W. Bolton, N. Charlton, Vincent Delport, P. A. Russell, and G. R. Shotton.

Following a unanimous vote of thanks accorded to retiring president John Sheehan, Colin Gresty was inducted into the chair and delivered his presidential address. Mr. Gresty, who joined (*Please turn to page* 192)





SOME RECENDE

Centrifugac

THE dual-metal centrifugal casting, encompassing unique combinations of properties, should find many different applications in the future. The idea of casting two dissimilar type metals successively within a centrifugal mold is not new but, so far as actual practice is concerned, recent accomplishments represent something of a pioneering effort. The dual-metal castings are spoken of as one group or one type of product, yet each combination presents its own metallurgical problems and offers specific advantages particular to that combination.

As to what applications are suitable for dual metal

Fig. 1—Textile roll, consisting of AISI Type 316 stainless steel outer layer and gray iron inner layer, is used under corrosive conditions

Fig. 2—Panorama showing microstructure through the fusion zone of the roll shown in Fig. 1. Note that below the fusion zone the cast iron has dissolved sufficient chromium from the stainless steel layer to produce some excess or free carbide. (Etched, X100)

Fig. 3—Cross-sectional view of dual-metal roll consisting of a precipitation hardening stainless steel outer layer and gray iron core

DEVELOPMENTS IN Casting

In this second and concluding article on centrifugal casting developments the authors describe applications of dual-metal castings in which dissimilar type metals are cast successively within a centrifugal mold

By M. L. SAMUELS
Metallurgist
and DR. A. E. SCHUH
Director of Research
United States Pipe & Foundry Co.
Burlington, N. J.

castings, the only generalization that can be drawn up is that no generalization is possible. At one time the proposition was entertained that in no case where a single metal casting could do the job would a dual metal one be recommended, in view of the fact two furnaces and extra handling in casting would be required. This rule does apply in some cases, especially with relatively thin wall tubing and certain alloy combinations, but in other cases, where weights are comparatively large and numerous or repetitive castings are involved, the production disadvantages thought to pertain to dual metals almost or completely disappear.

Nevertheless, each case is appraised before recommendations are made wherein advantages and limitations are carefully considered. The novelty of the dual-metal product cannot dictate its use where cost of manufacture and service merits are out of line with ordinary single metal castings. These comparisons will be taken up with each product to be described.

A. Dual-Metal Chill Iron-Gray Iron Rolls—Press Fitted Journals—These rolls, as shown in Figs. 5, 6 and 7, are manufactured over the approximate size range of 4 to 20 in. OD x 4 to 72 in. long x any desired ID consistent with the other dimensional requirements. The hardness of the chill layer, in plain carbon and low alloy irons, is varied as desired over the range from sixty to the middle seventies on the Shore scale.

Attention is called especially to the bond between the chill and gray irons. There is a tendency of those not familiar with the product to suspect this as a source of weakness—to suspect that the casting is, in principle, two concentric tubes which may come apart under provocation. Many rolls have purposely been broken up under a drop hammer and the fractures have always been found to extend to, into, or through the gray iron core metal and never circumferentially around the junction.

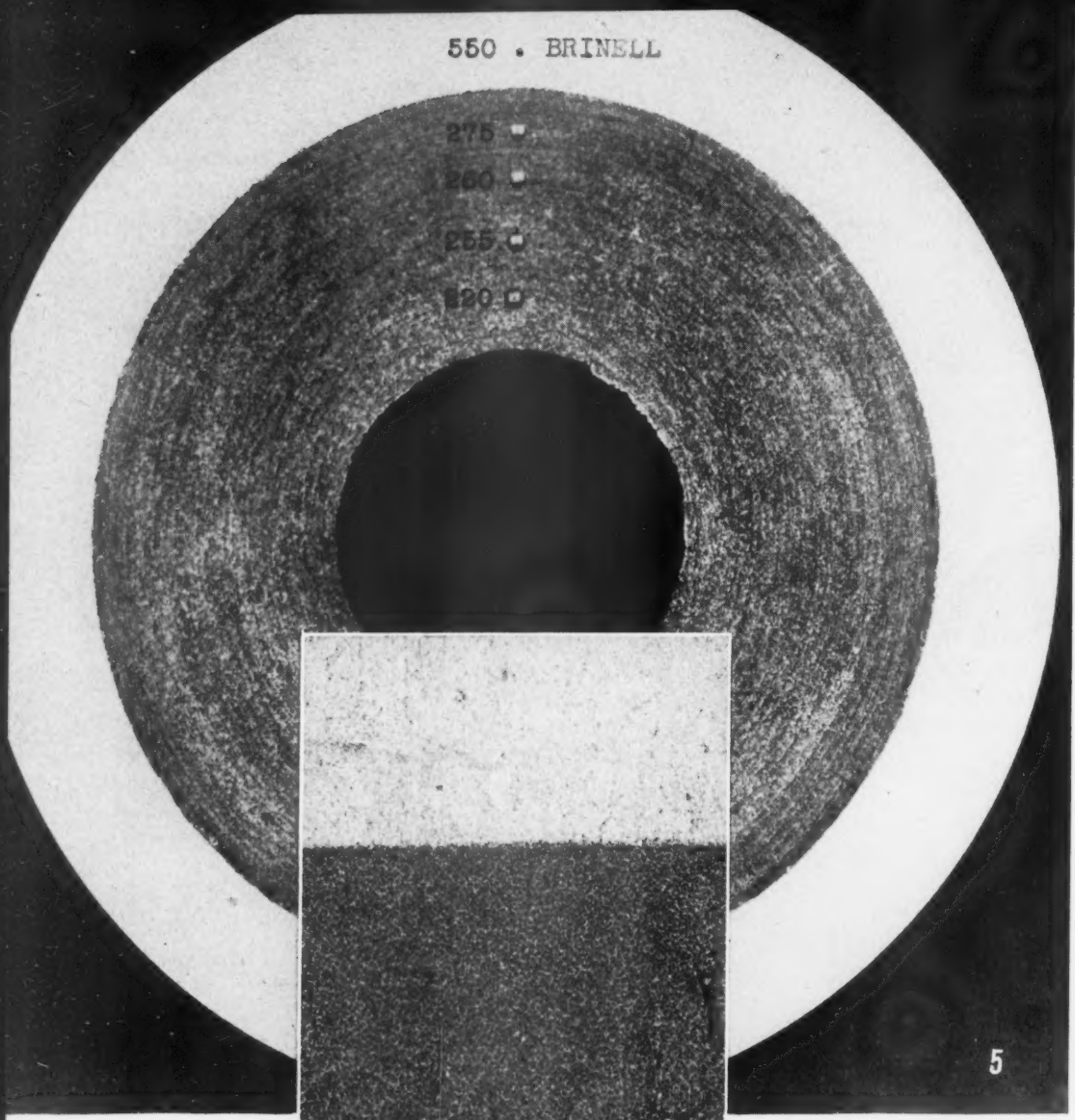
Other property characteristics are exactly those to be expected of the two irons—the hardness of the chilled iron is dependent upon its composition and cooling rate just as in conventional statically cast chill rolls; the strength and toughness of the core iron depends upon its composition and thermal history in a similar manner to ordinary gray iron castings.

In comparison with statically cast chill rolls, two basic advantages may be listed:

1. The depth of chill in the dual-metal roll can be predetermined and controlled simply by varying the weights of chill and gray iron poured into the mold. In statically cast single-metal rolls the depth of clear chill depends upon compositional control and rate of freezing, so numerous chill tests have to be run in an effort to avoid mottle coming too near the outer surface or excessive chill extending too deep into the core region.

2. Alloy content and casting temperatures of the two irons comprising the dual metal roll can be handled independently and thereby tailored to their respective optimum properties, since each is melted in a different furnace, whereas in single-metal rolls the composition selected necessarily represents a compromise between the hardness requirement of the outer chill zone and toughness or machinability required of the core metal.

Fig. 4—Dual-metal casting consisting of SAE steel as the outer layer and a Ni-Hard chill iron lining

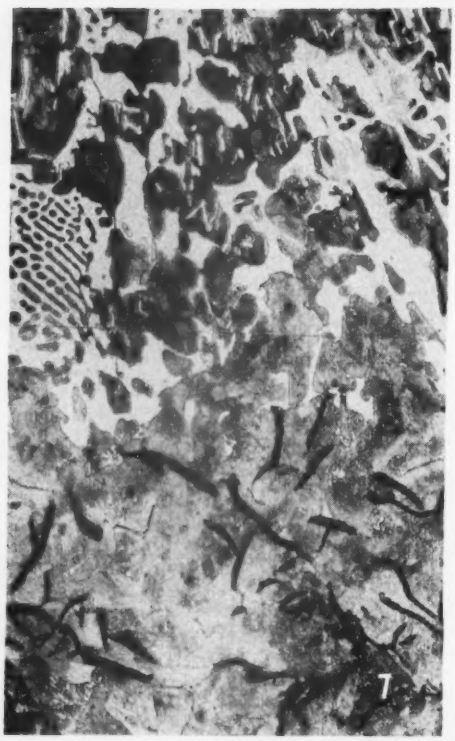


Centrifugal Casting . .

Fig. 5 — Cross-sectional view of 9-in. OD chill roll having chill iron outer layer and gray iron core

Fig. 6—Longitudinal fracture from dual-metal chill-gray iron roll. OD (upper surface) not machined

Fig. 7 — Microstructure through the fusion zone of a chill iron-gray iron roll. (Etched, X100)



B. Chill Iron-Gray Iron Rolls for Hot Metal Rolling—Integrally Cast Necks—Figs. 16 and 17 show a dual metal roll for wire rod mills in which the neck and wobbler sections are cast integrally with the body of the roll. Conventional statically cast rolls contain mottle, thereby shortening the potentially useful life of the roll and simultaneously producing poor rod surfaces. A comparatively thick layer of mottle free chill is desired, since many redressings are applied and approximately 1½ in. are ultimately removed from the outside diameter before the roll is scrapped. The assurance of this desired depth of clear chill in the dual metal roll affords longer life and better rod surfaces toward the end of the redressing cycle.

These centrifugally cast dual metal rolls contain a small central cavity, whereas the static product is solid. Since the central portion includes largely the neutral stress zone, the strength of the roll is adequate for most applications, but, when necessary, a high-strength core metal is employed. Long range field tests of these composite rolls for steel rod mill use have shown highly satisfactory performance.

C. Stainless Steel-Gray Iron Rolls—These rolls, as shown in Figs. 1 and 2, are being used in the textile and paper industry under corrosive conditions where pickup of corrosion products results in contamination

of the materials being processed.

Fig. 3 shows a similar roll of a smaller size consisting of a precipitation hardening stainless steel, Armco 17-4 PH, and gray cast iron. The stainless portion of this roll can be hardened to approximately 400 brinell by a low-temperature heat treatment, thereby combining abrasion resistance, needed in grinding applications, with corrosion resistance.

The present size range of the stainless steel-gray iron rolls extends from 6 up to 22 in. in diameter and to a present maximum of 98 in. in length. The inside diameters vary correspondingly with the OD, with the stainless outer layer ranging from $\frac{3}{8}$ to $\frac{3}{4}$ in. in thickness.

The primary advantage of the product shown in Fig. 1 pertains to the saving in expensive and critical alloys. The large mass is desired for rigidity and yet the outer surface is the only one requiring high resistance to corrosion. This dual metal casting displaced a roll formerly made by fitting rolled and welded stainless plate sections around a cast iron cylinder. Besides the economy of production, the metallurgically bonded junction has resulted in better performance of the rolls in service.

D. Plain Carbon or Low Alloy Steel-Gray Cast Iron Liners—Fig. 8 is typical of dual-metal cylinder liners consisting of an ordinary steel outer layer and a pearlitic or acicular cast iron inner layer. Figs. 9 and 10 show the fusion zone between the steel and cast iron layers and microstructure of the cast iron.

The primary purpose of this dual metal structure is

Fig. 8—Diesel cylinder liner consisting of SAE 1020 steel and an inner layer of acicular cast iron

Fig. 9—Microstructure through fusion zone of steel-acicular cast iron diesel cylinder liner. (Etched, magnification X100)

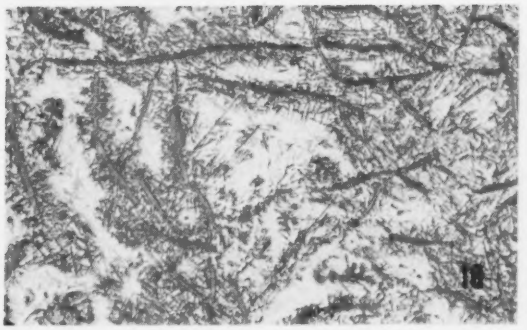


Fig. 10—Microstructure on the inner or wear surface of diesel cylinder liner, showing Type A graphite and a hard or acicular matrix. (Etched, X100)

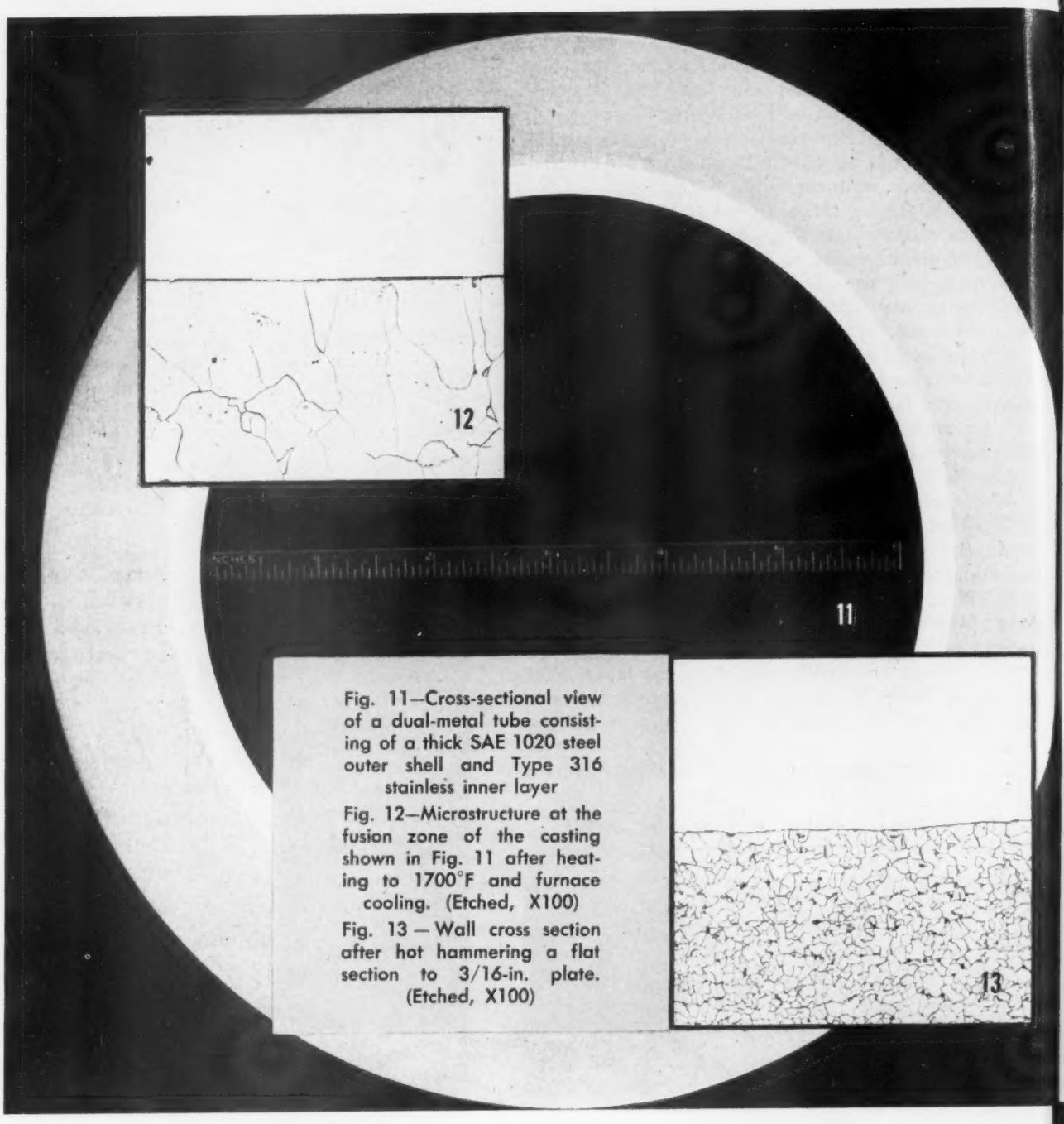


Fig. 11—Cross-sectional view of a dual-metal tube consisting of a thick SAE 1020 steel outer shell and Type 316 stainless inner layer

Fig. 12—Microstructure at the fusion zone of the casting shown in Fig. 11 after heating to 1700°F and furnace cooling. (Etched, X100)

Fig. 13 — Wall cross section after hot hammering a flat section to 3/16-in. plate. (Etched, X100)

Centrifugal Casting • • • •

to combine the good wear properties (resistance to galling or seizing) of a pearlitic or acicular gray cast iron with the strength and toughness of steel. Also, the steel outer layer is suitable for welded construction which, in some cases, effects a saving in weight or fabrication costs. The conventional competitive products are chrome-plated steel and single-metal gray cast iron liners. Savings of costly or strategic material, with the exception of the chrome plate, do not enter the picture so only those applications where the greater overall toughness of the dual-metal liner effects an important saving in weight, or where welded construction is an advantage, are open.

E. Plain or Low Alloy Steel-Ni-Hard Tubes—Fig. 4 shows a dual metal tube consisting of a plain carbon steel outer layer and a Ni-Hard inner layer. The Ni-Hard layer shows a hardness of 600-650 brinell and has the high wear resistance usually attributed to this alloy. This product has been used as the bowl portion of Banbury mixers and replaces a steel shell with a welded-on Stellite inner layer. The cost is less than that of Stellite welding rods plus labor. Maximum size produced to date has been 25½ in. OD x 22⅜ in. ID x 32 in. long.

In this particular product no comparisons can be made with single metal castings except where service requirements are mild enough for a carburized steel shell to come into consideration. A straight Ni-Hard casting will not stand welding on its outer surface

nor would strength and toughness be sufficient.

In addition to the Banbury mixer liner, some other applications involving severe internal abrasion are being pursued. The primary interest in the case of the steel outer shell and Ni-Hard inner layer concerns better overall properties, namely, abrasion resistance combined with strength, toughness and weldability, rather than a saving in critically scarce or expensive alloys.

F. Plain Carbon or Low Alloy Steel-Stainless Steel Tubes—This product, as shown in Figs. 11, 12 and 13, is similar in many ways to the so-called clad materials widely used as sheet and plate. Flat clad products are not processed into rolled and welded tubing because of difficulty in welding the two-layer structure. In considering potential uses, there probably are many applications involving corrosive conditions where a thin layer of any of the stainless steels on the inside or outside of a tube is sufficient for adequate protection. Other applications might make use of medium-carbon, low-alloy steel as the major wall thickness, which will respond to heat treatment in order to obtain high strength. Two major advantages of the centrifugally cast clad tubing are inherent: (a) a saving in expensive alloys, and (b) obtaining, through heat treatment, mechanical properties which an all-stainless product cannot meet. The value of this type of product to the chemical and allied industries is apparent.

G. Miscellaneous Dual Metal Castings—By suitable adaptations of the basic casting method the following additional combinations of metals have been cast:

	Outside Metal	Inside Metal
1.	Steel	Copper (Figs. 14, 15)
2.	Steel	14% Si Iron
3.	Copper	Gray Cast Iron
4.	Steel	Cupro: Nickel
5.	Steel	Monel Metal
6.	Steel	Stellite or Hastelloy
7.	Cast Iron	Stellite or Hastelloy
8.	Copper	Stellite or Hastelloy
9.	Steel	Pure Nickel

Conclusion—An endeavor has been made to describe certain recent advances in the field of centrifugal casting, with particular reference to the method in which metal molds are employed. A number of process improvements have been effected, some of which are described. These process changes have made possible various new or improved products, several of which are also described.

Although limited to the production of cylindrical bodies, one of the chief advantages of the basic casting method is its versatility. A wide array of new products has been made and future possibilities are challenging, particularly when the dual-metal products are considered.

The field of manufacture lies somewhere in scope between that covered by jobbing shops and mass-production plants. The latter, owing to their size and the cost of changing setups, are frequently in a poor position to satisfy special needs, which can be readily and economically met by these newer centrifugal casting methods.

It is hoped that the information regarding these new activities will contribute something of benefit in these difficult times. Various opportunities of conserving strategic materials or providing new products to do new jobs or old jobs better are indicated.

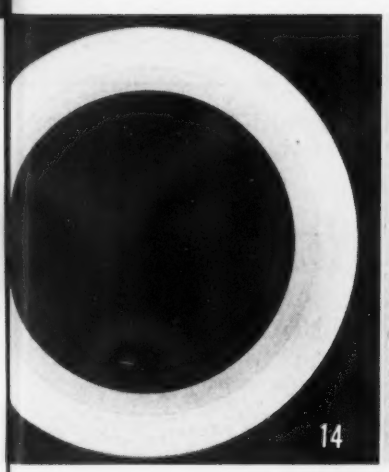


Fig. 14—Cross-sectional view of dual-metal casting consisting of SAE 1020 steel on the outside and inner layer of pure copper. Fig. 15—View of fusion zone between the copper and steel after fine grinding. Copper is shown above and steel below the midpoint. (Unetched, X100)

Fig. 16 — This wire rod mill roll is a dual-metal casting

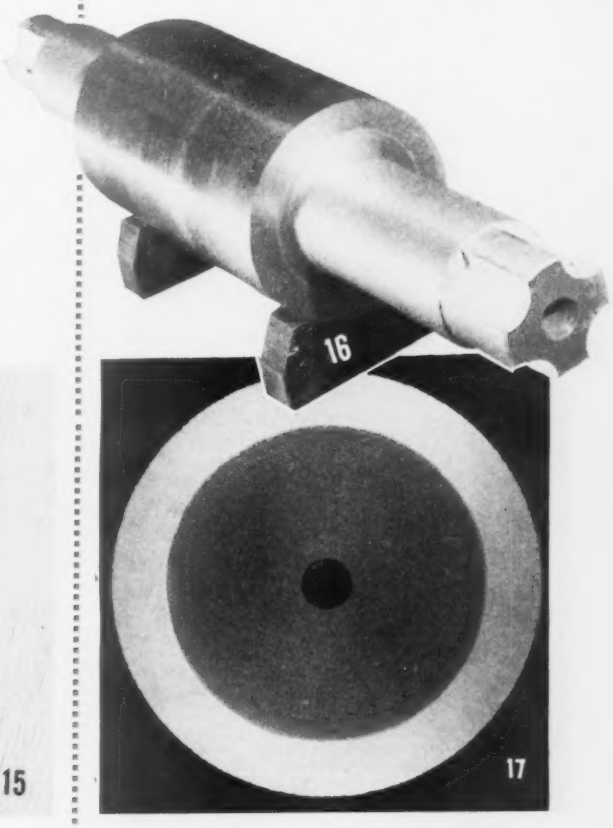
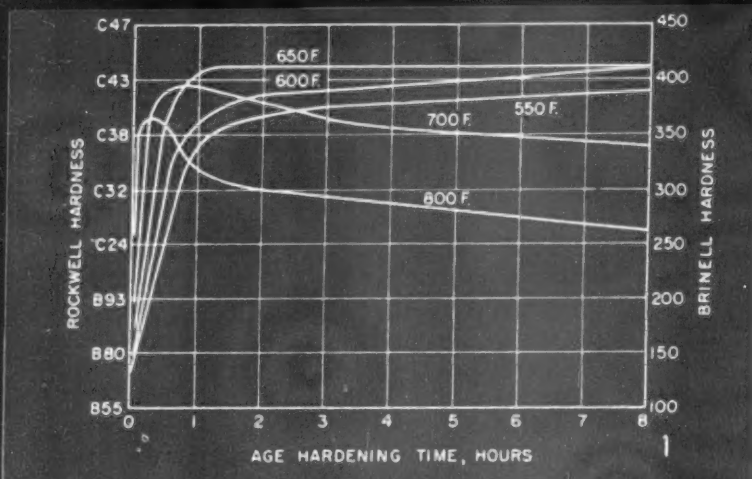
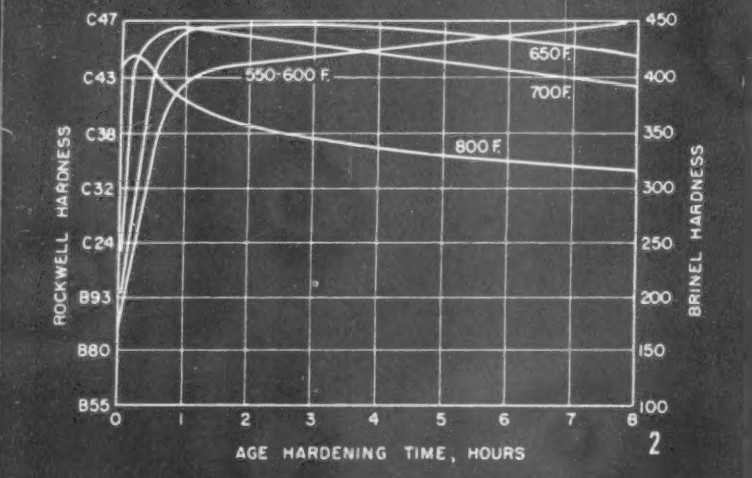
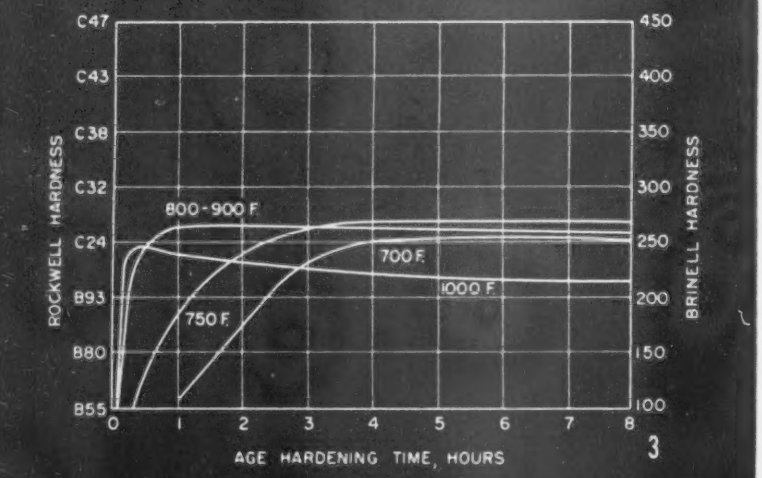
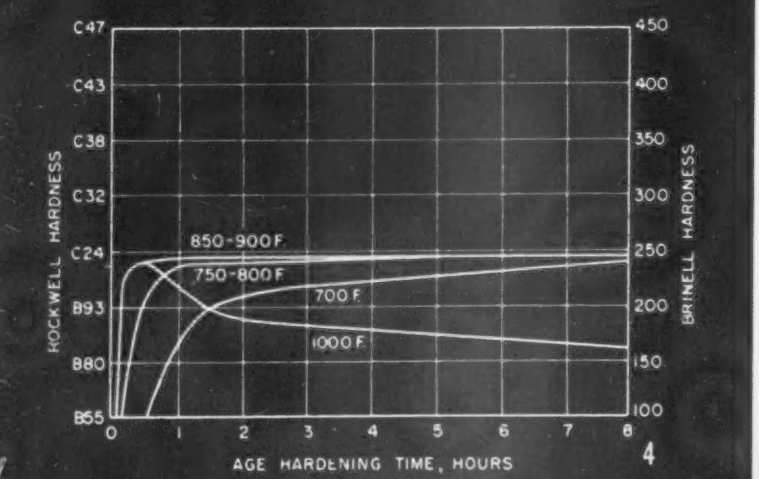


Fig. 17 — Cross-sectional view of roll similar to that in Fig. 16. Neck and wobbler sections are cast integrally with body









BERYLLIUM

By JOHN T. RICHARDS
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Reading, Pa.

THE steady progress made by beryllium copper the last few years has led to new properties, uses and processing methods. The original 2 per cent beryllium-content alloy has been improved and modified, so that it now delivers substantially higher properties, while alloys of new compositions have evolved which offer special advantages in certain fields.

The same properties—high strength and good corrosion resistance—which make wrought beryllium copper ideally suited as a spring material, are also of interest to designers of cast parts. Through age hardening, castings develop the same useful properties as obtainable in wrought forms. This means that parts can be machined or formed in the soft condition, then hardened by means of a simple, low-temperature treatment for best properties. Thus the tensile strength of solution-annealed castings can be readily increased from 65,000 to 170,000 psi.

Since beryllium copper is essentially a high-copper alloy, it retains the corrosion-resistant, nonsparking and nonmagnetic characteristics of copper. Other

Figs. 1-4—Effect of age hardening time and temperature on the hardness of cast and solution annealed beryllium copper. Fig. 1, alloy 20C; Fig. 2, alloy 275C; Fig. 3, alloy 10C; Fig. 4, alloy 50C

TABLE I—Nominal Composition of Beryllium Copper Casting Alloys

	Alloy			
	20C	275C	10C	50C
Beryllium	1.90-2.15%	2.50-2.75%	0.45-0.75%	0.30-0.55%
Cobalt	0.35-0.65	0.35-0.65	2.35-2.70	1.40-1.70
Silver	.....	.....	.....	1.00-1.15
Copper	Balance	Balance	Balance	Balance

TABLE II—Limiting Composition of Beryllium Copper Casting Alloys

	20C	275C	10C	50C
Beryllium	1.90-2.15%	2.50-2.75%	0.45-0.75%	0.30-0.55%
Cobalt	0.35-0.65	0.35-0.65	2.35-2.70	1.40-1.70
Silver	.....	.....	.....	1.00-1.15
Silicon	0.20-0.35	0.20-0.35	0.15 max.	0.15 max.
Iron	0.25 max.	0.25 max.	0.10 max.	0.10 max.
Aluminum	0.15 max.	0.15 max.	0.10 max.	0.10 max.
Tin	0.10 max.	0.10 max.	0.01 max.	0.01 max.
Lead	0.02 max.	0.02 max.	0.01 max.	0.01 max.
Zinc	0.10 max.	0.10 max.	0.01 max.	0.01 max.
Nickel	0.20 max.	0.20 max.	0.10 max.	0.10 max.
Chromium	0.10 max.	0.10 max.	0.01 max.	0.01 max.
Copper	Balance	Balance	Balance	Balance

Improved properties and broader applications of beryllium copper have resulted from development of new casting alloys. This article describes foundry practice, engineering properties, structure and uses of the four commercial beryllium copper sand casting alloys

M COPPER Sand Castings

properties resulting from heat treating include good electrical and thermal conductivity, and excellent resistance to wear, moderately elevated temperatures and low-temperature embrittlement. Color depends upon composition, ranging from copper to gold with increasing beryllium content.

Beryllium copper also offers certain casting advantages of particular significance to production men. Its relatively low pouring temperature simplifies foundry practice. Good fluidity in the molten state makes possible intricate detail with minimum machining and permits maximum freedom of design. Although this paper is concerned only with sand castings, beryllium copper can also be handled by permanent-mold, pressure, plaster-mold and investment casting techniques.

By virtue of its many advantages, beryllium copper sand castings are finding increased use. Typical mechanical applications are cams, bushings, gears, valve and pump parts, marine propellers, drawing and forming dies, and cavities for plastics. Electrical uses include circuit breaker and switchgear parts as well as other current-carrying members. In the welding field—flash welding dies, electrode holders and welding jaws may be sand cast. Safety tools and special castings are available where good nonsparking, nonmagnetic or corrosion resistant characteristics are desirable.

Several beryllium copper alloys now are produced. Each presents a different combination of desirable properties; so that it is possible to obtain, depending upon the alloy selected, tensile strength up to 170,000 psi, hardness to 450 brinell or electrical conduc-

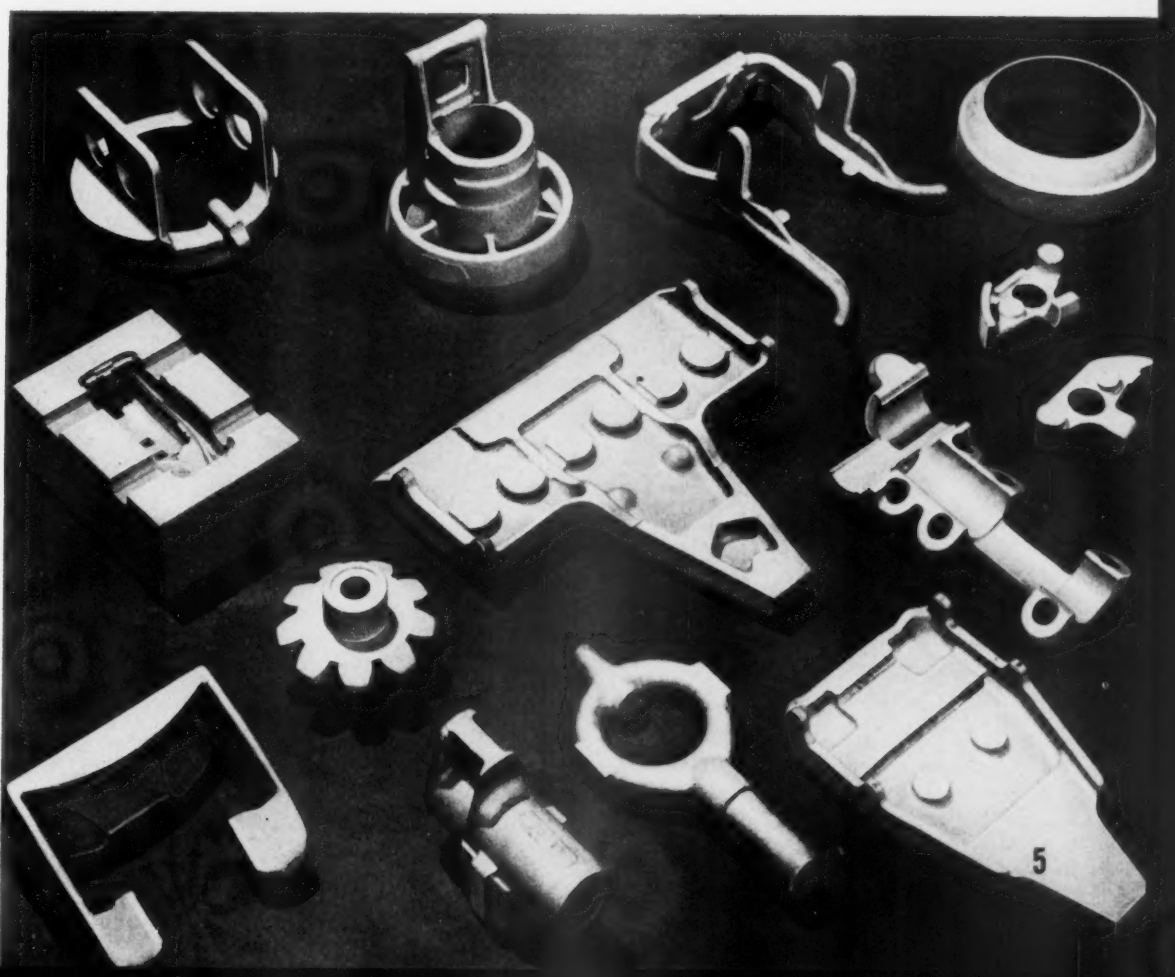


Fig. 5—Miscellaneous beryllium copper sand castings for heavy electrical, ordnance and machine tool applications

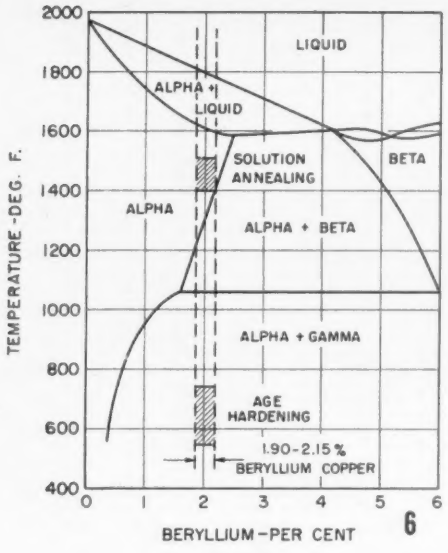


Fig. 6—Copper-rich end of the beryllium copper equilibrium diagram. This shows the solution annealing and age hardening ranges for 20C alloy

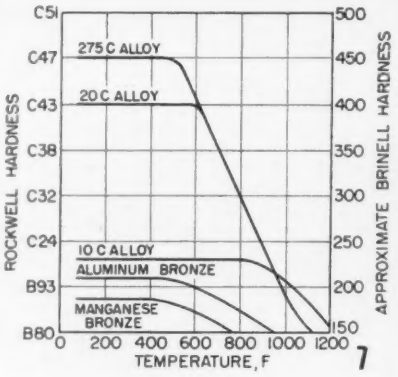
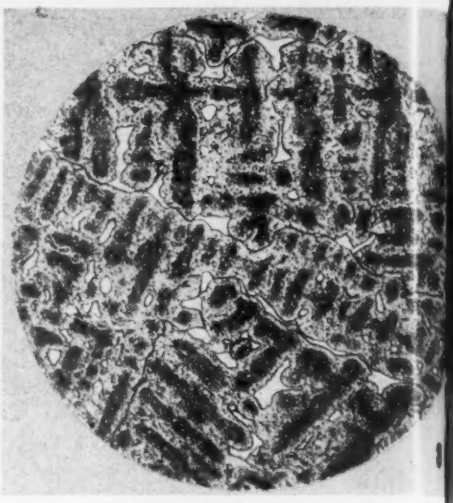


Fig. 7—Loss of hardness for several casting materials resulting from 15 hours at various elevated temperatures



Figs. 8-11 — Microstructures (X150) of 20C beryllium copper. Fig. 8, as cast; Fig. 9, age hardened for three hours at 600°F; Fig. 10, solution annealed three hours at 1470°F and immediately water quenched; Fig. 11, solution annealed and heat treated three hours at 600° F

tivity up to 50 per cent that of pure copper.

Table I lists nominal compositions of four commercial casting alloys. On account of its versatility, 20C alloy is frequently considered the standard for sand casting—the others being of more limited application. Alloy 275C is generally employed for plastics molds and similar applications requiring maximum hardness. Alloy 10C is used where conductivity is of greater importance than strength or hardness, while 50C alloy presents special advantages for resistance welding applications. All alloys are available as 3-oz, 2½-lb and 5-lb casting pigs.

Molding—In general, molding practice for beryllium copper is similar to that used for bronze. Natural molding sands can be depended upon to give good results, since pouring temperatures are relatively low (approximately 700-1000°F lower than for steel) and synthetic sands are not required. The following sand specifications will be suitable for most green sand work:

AFS grain size 100-150, AFS clay content 10-14 per cent, permeability 14-40, moisture 4-6 per cent.

Correct moisture content is important and should not exceed 6 per cent (4 to 5 per cent preferred), otherwise rough surfaces and gas cavities may result. This is especially true for large castings and high-conductivity alloys. A permeability of 14-18 gives good surfaces for small pieces; however, it may be

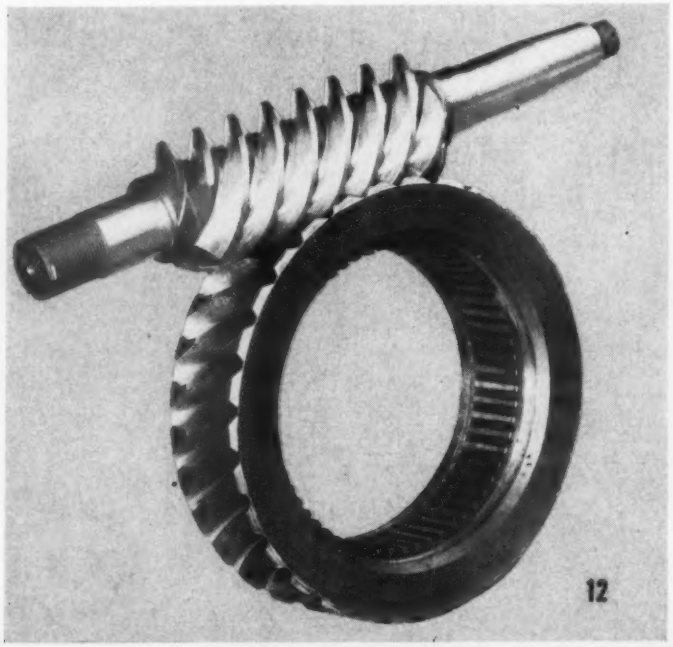


Fig. 12 — Beryllium copper (20C) provides wear resistance for this ring gear used in operation with steel worm

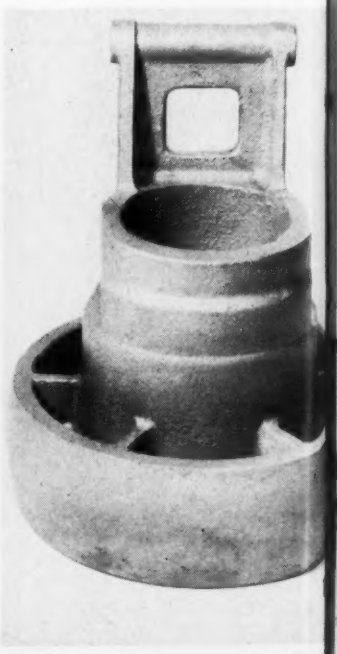
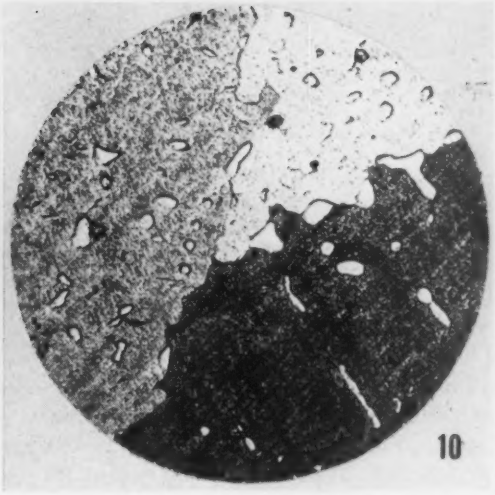
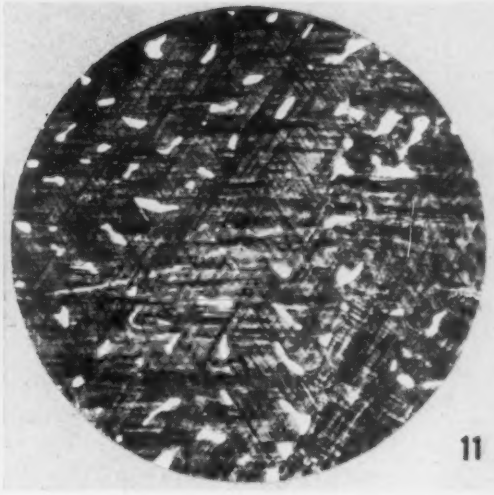


Fig. 13 — Beryllium copper (20C) offers needed strength and resistance to impact for this gun mount





necessary to run as high as 40 for large castings with some sacrifice in surface condition. In most cases, facings are not required, since a relatively smooth surface is normally obtained.

Where fine detail is necessary, such as in plastics molds, very fine sands give required intricacy of design with minimum finishing. French sands are sometimes employed for fine work requiring a smooth surface. Baking these molds may help to reduce steam generation during pouring.

The shrinkage in beryllium copper is similar to tin bronze and is less than generally found in manganese, aluminum and silicon bronzes. Gating should permit the metal to enter the mold at the bottom and provide adequate feeding with minimum agitation. Choke gates and strainer cores can be used to advantage in reducing turbulence. Best results are generally obtained by gating heavy sections, so that light sections farthest from the gate will freeze first. When a number of small patterns are mounted on a plate, it may be advisable to keep the runner in the cope and to have the metal flow past the gate and reverse into the casting.

Risers should be relatively large and located so that the last metal to enter the mold and hence the hottest, will be in the risers. Open risers not only serve as vents which aid in removing steam and gas, but metal may also be poured into them to insure adequate feeding through hot risers. For large castings, particularly with 10C and 50C alloys, an insulating cover over the riser will help to maintain temperature, reducing shrinkage and porosity.

The proper use of chills reduces porosity and shrinkage in heavy sections through rapid and uniform cooling. Cast iron chills are generally used.

Cores should be thoroughly baked, free from gas-forming materials and well vented. An open sand bonded with a good grade of core oil will give good results. Cores are generally baked for 45 to 60 minutes at 400-500° F, while a graphite wash may be employed to provide smooth surfaces.

Melting and Pouring—Although any of the following melting furnaces can be depended upon to give good results, they are recommended in the order listed: Induction, rocking indirect arc, coke-fired crucible, oil-fired crucible, gas-fired crucible.

Electric furnaces provide rapid melting with minimum loss of metal and, at the same time, permit close control of metal quality and pouring temperature. The slower melting rate of fuel-fired crucible furnaces means longer exposure to gas and other contaminants.

Some care should be exercised to prevent pickup of combustion products. Silicon-carbide crucibles are generally employed in induction and fuel-fired furnaces, while a neutral lining of the sillimanite type is recommended for rocking arc units.

For best results, each heat should be of known quality and composition. Virgin metal is generally used with clean foundry scrap such as gates, risers and uncontaminated turnings from previous runs. Contaminated or miscellaneous wet scrap should be remelted to give pigs of known compositon. These may be added to the charge as (*Please turn to page* 241)

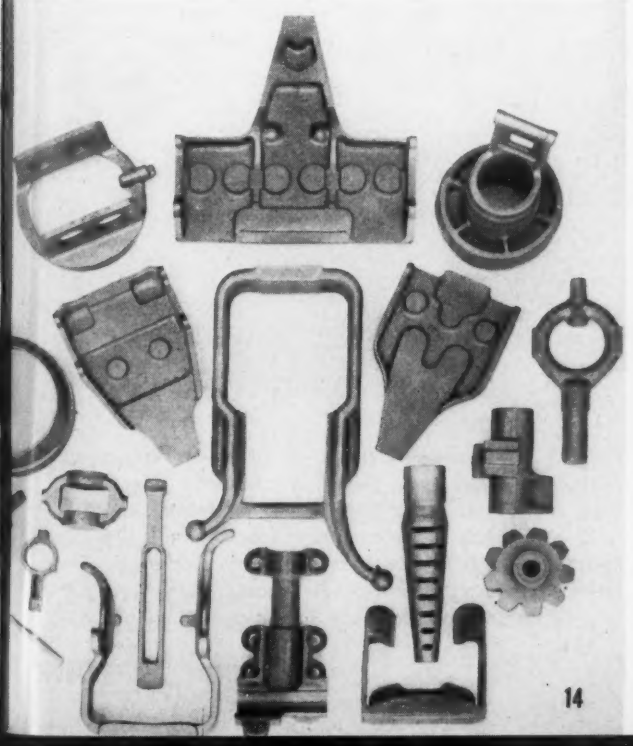


Fig. 14—Typical beryllium copper sand castings for electrical and mechanical equipment

NEW CHROMIUM ALLOY

Neutralizes Effect of Varying

By RALPH A. CLARK
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FOR many years foundrymen have been using chromium as an alloying element in gray cast iron. Without doubt, this element is the most useful of the carbide-forming alloys for refining the grain of iron and stabilizing the combined carbon content. As little as 0.25 to 0.50 per cent chromium is particularly effective in increasing strength, hardness, and resistance to wear and abrasion.

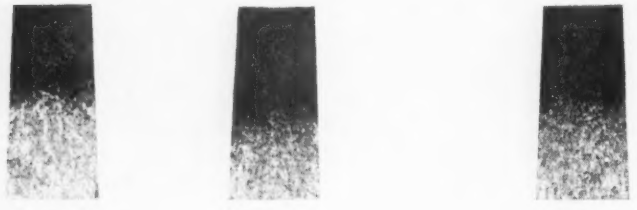
One of the most recent advancements in producing chromium iron is the development of a new silicon-chromium alloy (Electromet low-carbon foundry ferrochrome), specifically designed for making alloy additions of chromium to the ladle. In tests recently completed on automotive cylinder blocks cast from irons treated with this new alloy, research metallurgists of the Electro Metallurgical Co. found that the stabilizing tendency of the chromium combined with the inoculating influence of the silicon produced a markedly improved cylinder iron.

Avoiding Increase in Chill—It is well known that chromium, in addition to being highly effective in stabilizing the combined carbon of cast iron and promoting formation of the desirable pearlitic structure, will increase the chilling tendency of an iron. This is, of course, desirable in many applications. However, in producing castings with light-section corners and thin flanges, the amount of chromium that can be added in the form of standard ferrochrome may be limited by the increase in chill depth that can be tolerated. In the past, this limitation has sometimes been avoided by combining the chromium addition with a graphitizing alloy, or an inoculant of the graphitizing type.

The new silicon-chromium alloy is so balanced in composition that it confers on gray iron the benefits of a chromium addition, while avoiding an increase in the chilling tendency of the metal. The alloy has a nominal analysis of 30 per cent silicon and 50 per cent chromium. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill depth. Light-section castings, such as automobile and truck exhaust manifolds or stove parts, may easily be produced from 1 per cent chromium iron by a simple ladle addition of the alloy to any base iron that would be suitable for casting the same parts in unalloyed iron.

Chill Tests—Because of its good wear resistance, chromium-bearing iron is particularly serviceable in

Fig. 1 (below)—These fractures of broken chill specimens show the effect on chill depth of chromium additions made with silicon-chromium alloy



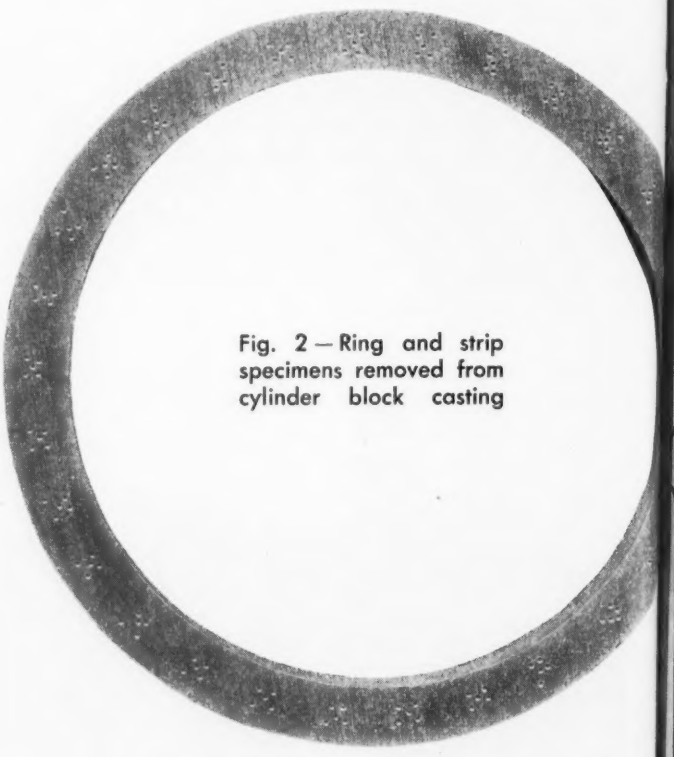


Fig. 2 — Ring and strip specimens removed from cylinder block casting

Figs. 3-4—Average Rockwell B hardness values at indicated positions in the ring and strip specimens from a cylinder block bore. No. 1: Untreated base iron containing 0.08 per cent chromium. No. 2: Treated with 0.31 per cent chromium added as silicon-chromium alloy. No. 3: Treated with 0.44 per cent chromium added as silicon-chromium alloy

Tests on automotive cylinder blocks cast from irons treated with a new chromium-silicon alloy indicate that the stabilizing tendency of the chromium combined with the inoculating influence of the silicon produces a markedly improved iron. The alloy composition gives the iron the benefits of the chromium addition without raising the metal's chilling tendency

ooling Rate in Gray Iron

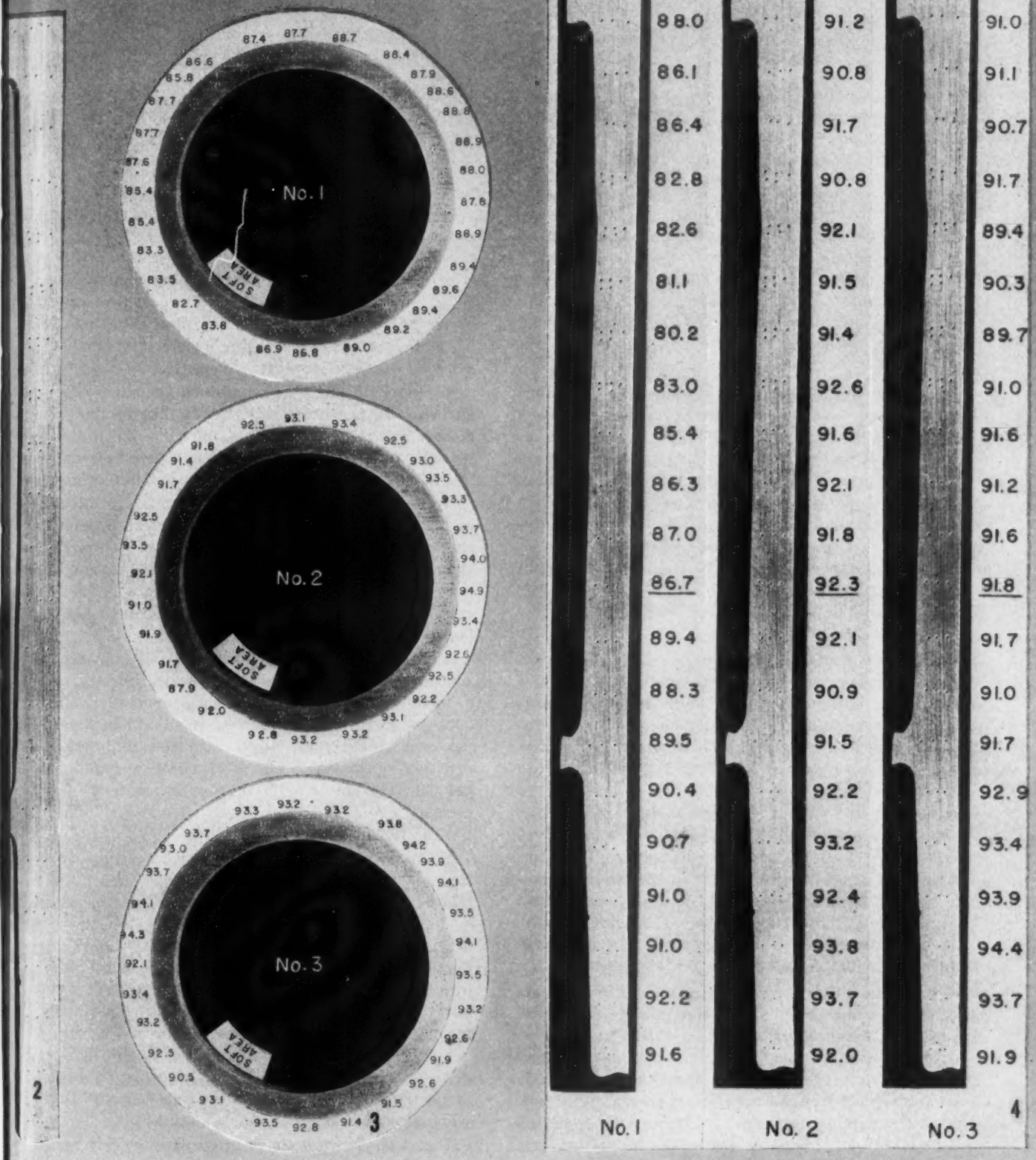


Fig. 5—Soft area in center of ring sample from No. 1 cylinder block casting. (X 250)

Fig. 6—Soft area on inner surface of ring sample from No. 1 cylinder block casting. (X 100)

Fig. 7—Soft area in center of ring sample from No. 2 cylinder block casting. (X 250)

automotive cylinder castings, especially those used for heavy-duty trucks and tractors. To demonstrate the effectiveness of the new silicon-chromium alloy, the Electro Metallurgical Co. laboratories at Niagara Falls, N. Y., arranged for the production of a number of automotive cylinder blocks cast from irons treated with the alloy and also from untreated iron. Chill test samples of the various irons were taken and forwarded to the laboratories for examination.

The effect of the silicon-chromium alloy on chill depth for additions of 0.34 and 0.51 per cent chromium is clearly shown in Fig. 1. The outstanding advantage of this alloy for introducing the chromium is that the chill is not appreciably increased and may even be slightly reduced, although relatively high percentages of chromium are added. The chemical analysis of each of these irons follows:

(A)—Total carbon 3.24, Mn 0.91, P 0.11, S 0.14, Si 2.12, Ni 0.08, Cr 0.14.

(B)—C 3.26, Si 2.31, Ni 0.11, Cr 0.34.

(C)—C 3.24, Si 2.45, Ni 0.13, Cr 0.51.

Cooling Rate and Hardness—One of the main advantages of using the new silicon-chromium alloy is that greater uniformity in structure and hardness is obtained throughout the castings. The effect of variation in section thickness on the cooling rate of iron castings is well recognized. Work done by a number of investigators has demonstrated that the rate of solidification and the subsequent cooling rate of the casting, as controlled by the thickness of section, has considerable effect on the metallographic structure and physical properties of gray iron. Generally speaking, the hardness and strength of a given cast iron will decrease with an increase in section size, and the amount of decrease to be expected in castings of simple design has been rather well determined.

A fact not so well recognized is that, in intricate castings of relatively light section, the freezing rate varies with changes in the section thickness at given points in the casting. Also, subsequent cooling may be influenced a great deal by designs that embody light-section sand cores between adjacent metal sections. The sand core may be heated rapidly to a high temperature and, in many cases, the insulation provided by this hot core sand may delay cooling of the casting, in the temperature range between solidification and shakeout, to a sufficient degree to have a substantial effect on the microstructure and utility of the casting.

Another point that is sometimes overlooked is that relatively light sections often freeze rapidly enough to cause the formation of undercooled structures. These are characterized by abnormal types of graphite and, in many cases, by a ferritic rather than the generally desired pearlitic structure.

As a result of these conditions, there may be wide variation in the structure and quality of the iron in different locations of a casting like an automobile cylinder or a diesel head. This can be true even when the sections are of the same approximate thickness.

Tests on Cylinder Blocks—A cylinder block designed with a rather heavy boss in close proximity to the cylinder bore is a typical example of a casting that varies in hardness because of the section thickness and cooling rate. In this casting the side of the cylinder bore next to the boss will cool slowly, causing a soft spot in the area.

A test was run in which this type of cylinder block casting was poured from three separate irons: No. 1—A conventional unalloyed cylinder iron containing 3.38 per cent carbon, 2.07 per cent silicon, and 0.08 per cent chromium. No. 2—An iron containing 0.31 per cent chromium. No. 3—An iron containing 0.44 per cent chromium. The chromium content of cylinder castings Nos. 2 and 3 was added as a ladle addition of the new silicon-chromium alloy.

Each of these three cylinder block castings was sectioned. A ring specimen was removed from the cylinder bore at a location 5¾ in. from the top. A strip or bar specimen was also removed along the length of the cylinder, adjacent to the heavy boss. These particular specimens were selected because previous experience fixed the locations as the softest areas in the cylinder bore. The ring and strip specimens removed from one cylinder are shown in Fig. 2.

Surveys were made to determine Rockwell B hardness at approximately ½ in. intervals on both the strip and ring specimens, after the saw cut surfaces were ground parallel to insure accuracy.

Fig. 4 shows that the average Rockwell B hardness of cylinder No. 1 varied between 92.2 and 80.2 in the strip specimen. This is equivalent to a variation be-

Fig. 8—Soft area on inner surface of ring sample from No. 2 cylinder block casting. (X 100)

Fig. 9—Soft area in center of ring sample from No. 3 cylinder block casting. (X 250)

Fig. 10—Soft area on inner edge of ring sample from No. 3 cylinder block casting. (X 100)

tween 196 and 151 brinell hardness. Fig. 3 shows that the ring specimen from cylinder No. 1 varied from 89.6 to 82.7 Rockwell B (183 to 158 brinell). (All brinell readings given here were obtained by conversion from Rockwell B scale.)

Cylinder No. 2, containing 0.31 per cent chromium, varied between 94.0 and 90.8 Rockwell B (205 to 189 brinell) in the strip specimen; and between 94.9 and 87.9 (210 to 176 brinell) in the ring specimen.

Cylinder No. 3, containing 0.44 per cent chromium, varied from 95.5 to 89.7 Rockwell B (213 to 184 brinell) in the strip sample; and from 94.3 to 90.5 (208 to 188 brinell) in the ring sample.

The Rockwell B hardness figures reported above are the average of three to five readings for the strip specimens and five each for the ring specimens.

In making the hardness surveys, it was noted that the untreated iron, (cylinder No. 1) showed a marked difference between the hardness values taken at the center of the cylinder wall cross section (strip specimen) and those taken closer to the inside and outside surfaces. In this unalloyed iron, the hardness at a given location on the strip cross section varied as much as 8 Rockwell B units. Treatment with the silicon-chromium alloy resulted in a much narrower spread in hardness among readings at a given location. These differences briefly are shown in Table I.

TABLE I—Hardness at Different Points of Cylinder Wall Cross Section

Sample Cylinder Block	% Cr	Relative Position in Cross Section	Rockwell "B" Hardness —Distance from Cylinder Top, in.— ¼	1¼	2¼	3¼	4¼	5¼	6¼
No. 1	0.08	Outside	88.2	85.4	79.2	76.2	79.5	86.6	84.8
		Center	90.1	87.2	86.3	84.3	85.5	89.2	88.0
		Inside	90.3	85.8	82.9	82.8	84.1	83.0	87.2
No. 2	0.31	Outside	92.8	89.6	90.6	91.6	92.0	91.6	92.3
		Center	94.3	90.0	91.3	90.3	92.1	92.4	91.7
		Inside	94.8	92.8	90.6	92.7	93.1	92.6	93.0
No. 3	0.44	Outside	94.9	90.5	91.2	90.0	89.5	90.8	91.7
		Center	95.9	91.2	92.0	89.9	92.1	90.4	91.5
		Inside	95.7	90.5	91.8	91.0	89.5	92.3	92.3

Metallographic Examination—Specimens for metallographic examination were prepared from the bar samples at distances approximately 3¼ and 10¼ in. from the top of the cylinder, while specimens cut through the soft area of the ring sample represented a distance on the bar samples of about 5¾ in. from the top. Specimens were also prepared from the ring samples about 180 degrees from the soft area.

The samples of the untreated iron were found to contain both eutectiform and normal flake graphite. In the harder portion of the bar represented by the 10¼-in. sample, some ferrite was associated with the eutectiform graphite and was more prevalent at the inside surface of the cylinder. In the soft portion of the bar represented by the 3¼-in. specimen and the "soft" specimen taken from the ring, appreciable ferrite was found to be associated with eutectiform and rosette graphite at both the center and surface of the specimens. At the surface of these samples, ferrite was the chief constituent in contrast to an appreciable amount of pearlite at the center. Although difficult to measure accurately, this highly ferritic area appeared to extend to a depth of about 0.1-in. from the surface. The 180-degree specimen taken from the ring was observed to have less ferrite associated with the eutectiform graphite than in the soft area.

In the samples treated with silicon-chromium alloy, there was a striking difference from the untreated iron in the amount of ferrite at the surface. The surfaces of the chromium irons contained some eutectiform and rosette graphite, but instead of a predominantly ferritic matrix, the structure was largely pearlitic. In addition, the abnormal structure was much shallower in the chromium-treated irons. The chromium content of 0.31 per cent suppressed the surface structure at a depth of 0.07-in., and 0.44 per cent chromium restricted it to a depth of 0.04-in.

The structure below the superficial skin of the chromium-treated irons was substantially pearlitic even in the zone that was soft in the untreated iron. This explains the increased and more uniform hardness of the chromium-bearing irons. No free cementite was observed in silicon-chromium alloy samples.

Experience has indicated that an excellent balance between machinability and satisfactory resistance to wear can be obtained in castings treated with the new silicon-chromium alloy. The results here reported from its use are typical of the benefits being regularly obtained in automobile and tractor cylinder castings. Addition of this alloy has proved a thoroughly practical method of obtaining increased uniformity of hardness with a consistently pearlitic structure in this type of casting.

Nickel-Aluminum B

Physical properties of aluminum bronzes containing nickel additions up to 5 per cent are described in this first of two articles. In this role nickel contributes strength plus resistance to corrosion, wear and heat

THE aluminum bronzes are a foundryman's answer to the need for a tin-free, high-strength alloy that possesses corrosion and heat resistance of a higher order than is obtainable in the manganese bronzes or high strength brasses.

Both manganese and aluminum bronzes depend upon their iron and aluminum contents for strengthening and hardening effects. While manganese bronze contains small amounts of aluminum and iron, the quantities used in aluminum bronze are two to four times greater. In the transition from manganese to aluminum bronze, the element zinc, which is present up to 40 per cent in the manganese bronze, is abolished from the composition. With this change, the "dezincification" hazard of manganese bronzes, which occurs in salts and sea water and under relatively strong corrosive conditions, is eliminated. The aluminum bronze becomes host to a milder form of a like disease with similar symptoms called "de-aluminization."

Nickel additions up to 5 per cent contribute strength and stability and aid in the defense against attack from corrosives, wear or heat. The strengthening, grain-refining and stabilizing influence of nickel upon the aluminum bronzes, strongly resembles the effect of nickel upon steels. Like steels, these bronzes may be heat treated to increase their strength and hardness. They are strong, tough, weldable, workable and brazeable, thus lending themselves to a broad range of commercial usage. They may be sand cast, die cast, rolled, forged or extruded, thereby making their cast forms complementary to wrought elements in the construction of engineering assemblies.

Composition and Properties—In general, the cast aluminum bronze commonly made contains approximately 10 per cent of aluminum, with nickel contents up to 5 per cent. Wrought forms for plate and sheet are often made in tougher, and weaker, lower-aluminum alloy levels, while specifications[1] for bars, rods and shapes more nearly resemble the specification for castings. Two specifications for castings of the nickel-alloyed type are available. Of these two, the 9D grade is more generally used. The text of this discussion will be largely centered upon it. The specification values shown in Table I are minimum, except where noted, and in normal production are readily exceeded.

Specifications for Grades 9C and 9D recognize the importance of nickel additions of the order of 2 per cent to 5 per cent, in 10 per cent aluminum bronzes. The nickel-alloyed types are especially useful where strength, reliability and corrosion resistance are required. They possess a high resistance to cavitation-erosion and corrosion fatigue.

The British Standard Specification[2] 1400-AB2-C for the 5 per cent nickel alloy, works to a lower aluminum range (8.5 to 10.5 per cent) and with other elements unchanged, develops a somewhat greater ductility which may be of considerably greater value in certain applications than high tensile strength. An abstract of the British engineering properties data follows:

PROPERTIES OF NICKEL ALUMINUM BRONZE CASTINGS

	Sand Cast
Tensile strength, psi	85,000 min.
Yield strength, psi	38,000 min.
Elongation, per cent in 2"	12
Brinell hardness	180
Impact (Izod), ft lb	20–30
Fatigue limit (air), lb.	30,000 (approx.)
Corrosion fatigue limit (in sea water spray), lb.	20,000 (approx.)
Specific gravity	7.5–7.7
Coefficient of thermal expansion per ° C:	
20 to 100° C	17 x 10^{-6}
20 to 250° C	18 x 10^{-6}
Thermal conductivity (c.g.s. Units):	
at 100° C	0.082
at 400° C	0.126
Melting point	1904–1922° F
Patternmakers shrinkage	$\frac{7}{32}$ to $\frac{1}{4}$ in. per ft.
Modulus of elasticity in tension (lb/sq in.)	17.5 x 10^{-6}
Electrical conductivity (per cent I.A.C.S.)	
at 17° C	8
Magnetic properties	slightly magnetic

The nickel-aluminum bronzes may be heat treated by quenching and tempering them with an improvement in tensile values of 30 to 50 per cent, accompanied by an increase in hardness and a decrease in ductility. This will be discussed later.

In general, the nickel-aluminum bronzes of the ASTM Specification B148-49-9D grade, are used in the as-cast condition. They are able, in the as-cast condition, to excel other aluminum bronzes which require a heat treatment to develop similar strength properties. The nickel-aluminum bronze of the 9D grade can thus be used as-cast in many engineering applications without inviting the risks which attend heat treatment. This is especially significant in the production of large castings of diverse contours, such as machinery frames, pump impellers, ships' propellers, paper mill beaters, water works, flood control, and "impractical to heat treat" castings for large engineering projects.

Small castings, such as marine fittings, gears, pump and valve parts, electrical equipment, arc-welding grips, etc. similarly profit from their immediate application as cast without need for heat treatment. Simple shapes, such as sleeves, centrifugal bushings, bars and die cast parts, and sand-cast parts such as cams, rollers, valve guides, engine valve seats, aircraft parts, dies, etc. may, on the other hand, be processed through a heat treatment to develop maxi-

Bronze

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mum hardness or strength in accord with the greater cost expended in processing them for a maximum effort.

The aluminum bronzes in the range of 8 to 12 per cent aluminum behave very much like steels would in the range of 0 to 0.90 per cent carbon. The copper base, with a tensile strength of about 25,000 psi, remains an alpha solid solution but is brought up to a level of about 35,000 psi with 8 per cent aluminum, (Fig. 1). This point corresponds to the formation of a compound which becomes eutectic at 1060°F (570°C), and the next 2 per cent increase in aluminum practically doubles the tensile strength to 70,000 psi, just as in carbon steels the 50,000 psi strength of carbon-free steel is raised to 120,000 psi by the addition of 0.80 per cent carbon. Alloying ingredients increase the strength further, and in the case of aluminum bronze additions of 5 per cent each of nickel and iron raise the strength above 90,000 psi. Since these are as-cast values, the action must have been exerted upon the alloy during its normal cooling. There are at least two, and possibly three functions in which nickel contributes to the improvement.

In the first case, the grains formed upon solidification from the liquid grow at an extremely rapid rate at temperatures down to 1600°F. The presence of nickel and iron in the bronze retards the rate of grain growth and leads to better mechanical properties. Chill casting, where applicable, similarly shortens the period of grain incubation, by accelerating the cooling rate of the casting. Intergranular impurities or residues are more widely scatterd and correspondingly less deleterious in accentuating corrosion or fatigue and notch sensitivity in the resulting fine-grained structures.

The second contribution to improved mechanical properties which nickel exerts upon the ASTM B148-49-9D grade of bronze is similar in effect to the action nickel exerts in retarding the martensite to pearlite transformation in steels. Nickel additions of 5 per cent to certain steels make them "air hardening." They become stronger and harder upon being cooled in air from a red heat. Such steels also possess "depth-hardness." The ASTM B148-49-9D nickel-aluminum bronze acquires similar advantages.

The transformation rates in the bronze are much more rapid than in the steels, and the function of the 5 per cent of nickel is to overcome that handicap without introducing any new ones. Nickel-alloyed aluminum bronzes achieve stability in structure during cooling from the casting temperature, or during heat treating operations. Consequently, they do not

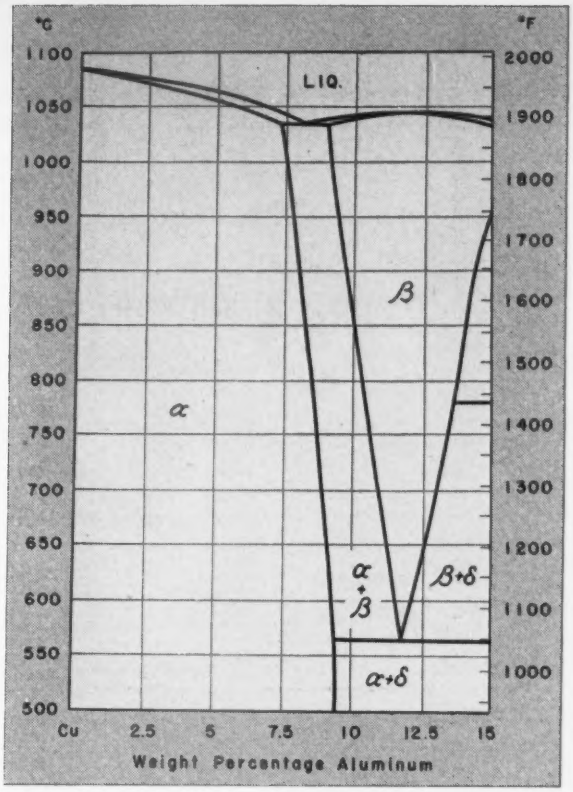


Fig. 1—Equilibrium diagram, aluminum-copper system

suffer from the deterioration in mechanical properties called "self-anneal," which is often brought about by the slow cooling of large or cored shapes, or by piling lots of hot small castings in a heap on the floor. In contrast, the mechanical properties of test pieces cut from commercial castings of the 5 per cent nickel-aluminum bronze, have been found equal to or better than those obtained from separately cast test bars[3].

The third factor is related to the second. Large castings retain "depth hardness." Heat treated castings possess "hardenability," and the final properties desired are more readily achieved and with less exacting control.

Cases in which the tensile strength and ductility of unalloyed aluminum bronzes have been cut in half through the influence of the "self-anneal" have been known to occur.

Corrosion Resistance—Corrosion resistance for the nickel-aluminum bronzes in fresh water or sea water is of a high order, quite in keeping with that of the high-copper alloys.

The advantage in erosion and cavitation resistance is shown in Table II. Manganese bronze is selected as a yardstick, with a value of one, against which competing bronzes are measured in this case for suitability for ship-propeller service.

Additional tests at Kure Beach, N. C., of the resistance to cavitation of bronzes seem to confirm the improvement which 5 per cent nickel confers and reemphasize the advantage which the nickel-aluminum bronzes possess over manganese bronzes (Table III) tin bronzes, and red brass.

The higher order of resistance to cavitation which the aluminum bronzes possess as compared to manganese bronzes, encourages their use for pump and

TABLE I—Abstract* of Composition and Mechanical Properties of Nickel-Aluminum Bronzes

Grade	Nominal Composition Cu	Al	Fe	Mn	Ni Max.	Tensile Strength As Cast	Tensile Strength Heat Treated	Yield Strength As Cast	Yield Strength Heat Treated	Elongation As Cast	Elongation Heat Treated	Bhn As Cast	Bhn Heat Treated
9C	83	10	4	.50	2.5	75,000	90,000	30,000	45,000	12	6	150	190
9D	78	10	4	3.5	5.5	90,000	110,000	40,000	60,000	6	5	190	200

* ASTM Specification B148-49.

*TABLE II—Salt Water Corrosion of Some Experimental Alloys

No.	Alloy	Salt Water Corrosion Characteristics	Salt Water Fatigue Test, psi	Ratio to Mn Bronze (OY) = 1.00 Cavitation Resistance	Ratio to Mn Bronze (OY) = 1.00 Corrosion-Fatigue Resistance
1	Red Brass (QOA)	Slight pitting	5,500	.52	.61
2	Tin Bronze (QOC)	Slight pitting	6,000	.56	.67
3	Mn Bronze (OY)	Severe dezincification	9,000	1.00	1.00
4	Special Mn Bronze (QU)	Dezincified—pitted lightly	9,500	1.52	1.05
5	Ni-Al Bronze (RD)	Severe dealuminization	20,000	6.13	2.22

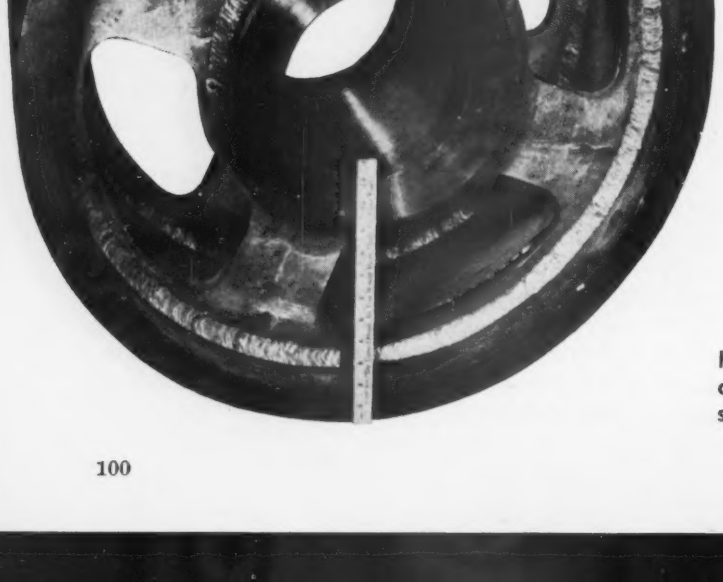
COMPOSITIONS OF MATERIALS REPORTED IN TABLE II

No.	Alloy	Cu	Zn	Al	Sn	Fe	Mn	Ni
1	Red Brass (QOA)	83.60	14.37	.08	1.64	.36	...	...
2	Tin Bronze (QOC)	85.70	6.22	.19	7.58	.33	...	...
3	Mn Bronze (OY)	57.12	41.00	.62	Nil	1.10	.29	...
4	Special Mn Bronze (QU)	48.99	44.90	...	.41	1.12	2.86	1.72
5	Ni-Al Bronze (RD)	79.75	....	10.07	...	5.09	...	5.03

*Data from—"Investigation of Materials for Marine Propellers", W. C. Stewart and W. L. Williams, *Proceedings*, ASTM, Vol. 46, 1946, pp. 836-845.

propeller service where conditions produce cavitation. The dezincification which occurs in manganese bronze over long periods of exposure is matched in the high strength aluminum bronzes by a corresponding disintegration called dealuminization. In propeller or impeller service, the cavitation factor usually determines the performance, while the disintegration by dezincification or dealuminization proceeds more slowly.

The data in Table IV list corrosion results for conditions of flow which are at slow as well as at high velocities.



The results indicate that the alpha bronzes with lower aluminum contents are more evenly corroded and at a lesser rate in quiet or slow-moving sea water. In high velocity water, they are more rapidly pitted. The jet tests illustrate a second feature, namely that the presence of a small percentage of iron in the No. 3 composition improves resistance to sea water erosion in this alloy. Copper-base alloys such as the cupro-nickels, in which small amounts of iron are completely soluble, are known to be improved in corrosion resistance by the presence of iron. There seems to be a distinct difference between the alpha aluminum bronzes and the cupro-nickels because, in the case of the nickel-aluminum bronzes, the iron-containing alloys appear to be more susceptible to pitting. This may some day be traced to the presence of a precipitated iron-rich component which accelerates localized corrosion. Table IV shows that the 9D grade of 5 per cent nickel, aluminum bronze (No. 5) is highly resistant to cavitation and also to erosion.

While the 9D grade of alloy seems to provide resistance to cavitation and erosion by its high aluminum and iron plus nickel contents, it was found to be more susceptible to fouling by marine organisms and to a corresponding pitting when exposed to quiet or slow-moving sea water.

The conclusions to which these data seem to point are that for propellers, impellers, pumps and valve parts subjected to high velocity sea water (No. 5), the high-strength nickel-aluminum bronze of the 9D grade of alloy offers a product suitable for such applications. For slow moving or stagnant immersion in sea water, the alpha aluminum bronzes (No. 3) containing less than 10 per cent aluminum, with little or no iron and with 2½ to 5 per cent nickel, would seem to be a better choice.

Fig. 2—Nickel-aluminum bronze gear blank made with centrifugally cast hub and rim welded to a cast spider. Photo courtesy Ampco Metal Inc., Milwaukee

TABLE III—Sea Water Erosion Tests on Brass and Bronze Using Submerged, Rotating Wheel

(60-day Tests—Sea Water 30° C—at 27 feet per second)

No.	Alloy	Cu	Sn	Zn	Pb	Al	Ni	Mn	Fe	Weight Loss IPY
1	Red Brass	86.3	4.7	4.8	3.9	..	..	..	..	.061
2	G Bronze	86.9	9.4	2.7	0.15	..	0.9	..	..	.039
3	Special Mn Bronze*	Bal.	..	9.72	..	5.32	5.0	0.75	0.93	.015
4	Ni-Al Bronze	Bal.	..	Trace	..	10.0	3.96	1.14	4.94	.017
5	Ni-Al Bronze	80.0	..	..	..	10.0	5.0	1.0	5.0	.005

* Damage to regular manganese bronze ranges from .010 to .030 IPY, depending upon seasonal temperature, etc.

TABLE IV—Sea Water Corrosion Tests on Nickel-Aluminum Bronzes

(Arranged in Order of Merit)

Quiet Exposure			Jet Tests[a]			Rotating Wheel[b]
No.	Mdd[c]	Max. Pit Depth[d]	No.	Mdd	Max. Pit Depth	No. Mdd
1	3.6	0	5	5.6	3	5 99
6	3.6	0	8	8.7	5	8 138
3	..	7	3	nd	6	3 134
8	8.1	44	6	nd	7.6	6 129
5	13.05	45	1	nd	8.4	1 192

(a) Jets velocity at 12 ft per second—water at 30° C.
(b) Submerged rotating wheel—at 27° C and 27 ft per second for 60 days.
(c) Mdd = milligrams per sq decimeter per day.
(d) Pit depth in mils per month.

ANALYSES

No.	Copper	Aluminum	Nickel	Iron	Manganese
1	Bal.	7.5	..	0.02	..
6	Bal.	7.5	2.3	0.02	..
3	Bal.	7.6	2.4	0.09	..
8	Bal.	10.6	3.4	2.5	0.04
5	Bal.	10.6	5.1	2.5	0.7

In this family of alloys, the cupro-nickel composition (mentioned later as a special alloy) containing approximately 12 per cent nickel, 1 per cent iron and 1½ per cent aluminum, represents the type of material toward which these data point where high velocity erosion is not a dominant factor.

Heat Resistance—Nickel-aluminum bronzes retain a high proportion of their strength at temperatures up to 750°F and this fact, coupled with their good resistance to corrosion and oxidation, makes them very suitable for service in steam plant, internal-combustion engines and chemical-engineering applications. Fig. 3 outlines the results of short-time tensile tests on sand cast test bars at temperatures up to 930°F (500°C).

Creep tests by Voce[4] on sand-cast specimens showed approximately as indicated in Table V.

The short-time elevated temperature tests of nickel-aluminum bronze indicate that very little deterioration occurs under 600° F (Fig. 3).

These temperatures are below those at which scaling, oxidation or sulphidization takes place. At temperatures in the range of 600 to 1200°F these alloys protect themselves with a thin tenacious, self-healing oxide or sulphide film, and by so doing they retard surface deterioration. They become useful in the glass industry, for example, for service as molds, dies, neck rings and plungers. The 9D grade of alloy provides a hard wear-resisting die, while the 9C or a lower aluminum alpha grade alloy with 6 to 8 per cent aluminum and 3 to 5 per cent nickel supplies a softer, more machinable product.

Closely related to the standard nickel-aluminum bronze alloys for this service, are the cupro-nickel grades which may contain 20 to 30 per cent of nickel with their aluminum contents at 4 to 8 or 8 to 10 per cent, again depending upon the degree of heat resistance desired compared to the greater machinability and lesser heat resistance of the softer, low-aluminum alloy.

TABLE V—Creep Tests on Bronzes

Material	Temperature °F	Load, psi	Creep Rate Cru*
Ni-Al Bronze	500	11,000	.042
Ni-Al Bronze	500	25,000	.42
10% Sn Bronze	500	7,500	.042
10% Sn Bronze	500	11,000	.42

* .10% creep in 1000 hours, or millionths of an inch per inch per hour.

TABLE VI—Oxidation Rates for Cast Iron and Cupro-Nickel Aluminum Alloy

		Cast Iron	Nickel-Aluminum Alloy (Approx)
	TC	3.33	
	Si	1.80	..
	Ni	.05	22
	Cu	.24	64
	Al	.01	7
	Zn	..	7
Oxidation—1600° F—4-hr Cycles—			
Inches Penetration Below Oxide Film—	5 cycles	.047	.001
	10 cycles	.076	.0015
	25 cycles	.148	.0014
Inches Thickness of Oxide Scale—	5 cycles	.006	None
	10 cycles	.009	None
	25 cycles	.013	None

TABLE VII—Properties of Lead-Alloyed Nickel-Aluminum Bronze

	Copper	Aluminum	Nickel	Iron	Manganese	Lead
Specification range:	78 min	7-12	5.0 max	2.5-4.5	3.5 max	1.0
Heat treatment:	1600° F, brine quench, 1200° F, second quench					
Mechanical properties:	Tensile Str., psi	Yield Str., psi	Elong., % in 2"	Reduction of Area, %	Hardness R_e	
	108,250	66,250	7	11	26.5	

Mechanical properties such as strength are unimportant for certain of these applications and frequently are ignored entirely. However, lead, which may weaken the metal at elevated temperatures and cause surface checking or hot cracking, is regarded as a contaminant. It is kept out of the composition or held to very low limits. In some cases a 30,000 to 40,000 psi strength is admissible.

A nickel-aluminum bronze, alloy of the glass-house type follows: Cu 62 per cent, Al 7 per cent, Ni 22 per cent, Zn 7 per cent. Commercial specifications for a material of this type place limits of 1 per cent maximum on iron contents and 0.25 per cent lead. They allow an aluminum content of 8 to 10 per cent. It is

apparent from some of the discussion above that an alloy at the 8 per cent aluminum level may be an alpha type and comparatively soft, while a 10 per cent aluminum product would be considerably harder. Aside from these differences, the purpose of this alloy is to resist heat and scaling. Mechanical properties are unimportant. A comparison of oxidation rates is shown in Table VI.

A more distant relative of this heat resisting family of aluminum alloyed nonferrous products is "K" Monel which in wrought form finds occasional usage in glass-house operations.

Wear Resistance—The high hardness and strength of the 9C grade of nickel-aluminum bronze invites its use for wear-resisting applications, especially those which run dry or where poor lubrication or actual abrasion prevails. Microstructures of castings used in these applications should be free of hard particle contaminants to provide a sleek, polished contact surface. Hard microconstituents must be finely dispersed or dissolved by heat treatment if necessary, to avoid risk of scoring or cutting.

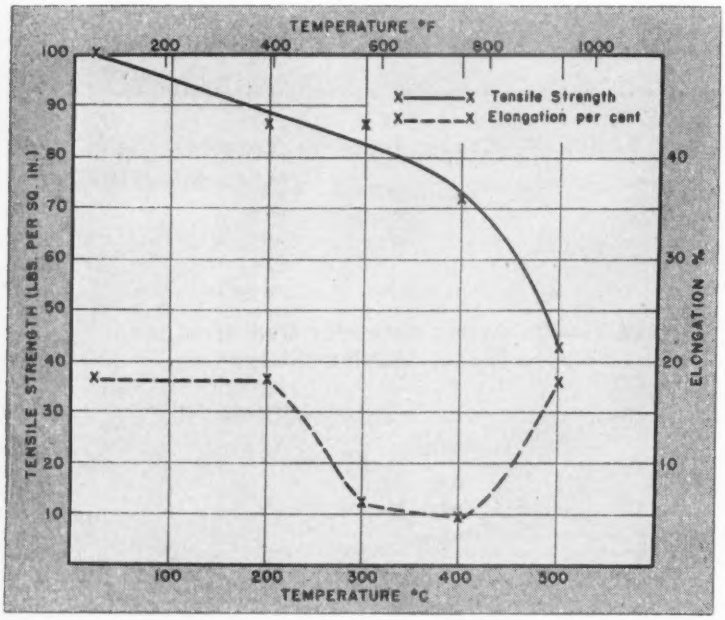


Fig. 3—Hot strength (held two hours at temperature and tested) of sand-cast nickel-aluminum bronze. Illustration courtesy Langley Alloys Ltd., London, via Mond Nickel Co., London

The nickel-aluminum bronze retains its hardness at higher temperatures than ordinary bronzes, and this factor enables it to resist wear in many elevated temperature applications. Its use for engine valve seats and valve guides, as well as for hot metal rolling mill slippers, washers and screw-down nuts, represents typical applications.

Machinability—Aluminum bronzes with a hardness of about 200 brinell possess machining characteristics that more nearly resemble those of mild steel of comparable hardness than those of common bronzes. High-speed steel and carbide cutting tools and cutting fluid coolants corresponding to those used for steels are recommended where aluminum bronze is machined.

As in the case of steels, improved machinability or free-cutting quality can be obtained at some risk to mechanical properties by introducing small amounts of lead. To the foundryman who is striving for top strength, or hot strength, or toughness, the entrainment of lead from lead-contaminated gates and sprues in his charging cycle, may plunge him into inextricable difficulties in passing specifications by a comfortable margin. Where requirements are not so exacting, lead may be selected to contribute toward better machinability. Grodsky[5], reporting upon tests made at the Naval Gun Factory, indicates that up to 1 per cent lead may be added without interference with forging or heat treating practices or damage to mechanical or welding properties. The welding tests were made with commercial aluminum bronze welding wire electrically applied. Typical properties for a 1 per cent lead alloyed Grade D, nickel-aluminum bronze are shown in Table VII.

Welding, Brazing, Soldering — Nickel-aluminum bronze can be readily welded, brazed and hard-soldered, or even soft-soldered. The latter fact is not always appreciated and many references have been made in the past to difficulties associated with the soft-soldering of aluminum bronze. These can now, however, be readily overcome by using ortho-phosphoric acid(H_3PO_4) as a flux. The density of commercial phosphoric acid is inclined to vary considerably and care should be taken to insure that the solution employed has a specific gravity of not less than 1.75. With this flux, good joints are reported, using any of the standard grades of tinsmith's solder. Fig. 2 illustrates a welded assembly.

The welding of nickel-aluminum bronze has also been satisfactorily solved and excellent welds can be obtained, using either the metallic-arc or oxyacetylene process. Welds are often made with ordinary aluminum bronze electrodes. Stronger welds can be made using welding rods having a composition similar to that of the base castings, but the welds are less ductile.

It becomes practicable to construct assemblies of the Grade D nickel-aluminum bronze castings with wrought metal shapes of similar composition such as the Aircraft Material Standards specification 4640B bronze. Joining the low aluminum alpha bronze with Grade D nickel-aluminum bronze castings may be chosen for assemblies requiring alpha toughness with Grade D hardness. The corrosion data would suggest further possibilities in fitting assemblies of Grade D—5 per cent nickel, aluminum bronze parts for resisting cavitation at jet speeds while sheltered parts subjected to slowly flowing or motionless liquid could be made of alpha bronzes of the 4 per cent aluminum, 4 per cent nickel type.

(To be concluded next month)

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5,867 Foundries

IN THE UNITED STATES AND CANADA

THE UNITED States has 5299 foundries, 105 fewer than existed two years ago. Canada, with 568 foundries, is nearly even with its 1949 total of 570. For the two countries the current total is 5867, against 5974 in 1949. These figures are compiled from the new edition of *Penton's Foundry List* just published by the Penton Publishing Co., Cleveland.

All but nine states showed a decrease in number of casting plants, and of the nine to record gains the only major foundry centers are Connecticut, Missouri and New York. Ohio continues the No. 1 foundry state with 561 shops, followed by Pennsylvania, Illinois, California, New York, Michigan, Indiana, and Wisconsin.

A mixed trend prevailed the last two years in number of United States foundries producing various types of castings. Today there are 9 per cent fewer plants making gray iron castings than in 1949; 7 per cent fewer are making brass and bronze, and 6½ per cent fewer are casting aluminum. On the other hand, magnesium casting producers have increased 16 per cent, malleable iron shops 4½ per cent, and the number of plants casting steel is 2½ per cent higher.

Despite the drop in number of aluminum foundries, users of the permanent mold castings process increased about 6 per cent the last two years. Ninety-one foundries in the United States and Canada said they are making investment mold castings.

Geographical Distribution of Foundries in the United States

	Total Foundries 1951	Total Foundries 1949	Gray Iron Foundries 1951	Gray Iron Foundries 1949	Steel Foundries 1951	Steel Foundries 1949	Malleable Foundries 1951	Malleable Foundries 1949	Total Nonferrous Foundries 1951	Total Nonferrous Foundries 1949	Exclusive Nonferrous Foundries 1951	Brass and Bronze Foundries 1951	Brass and Bronze Foundries 1949	Aluminum Foundries 1951	Aluminum Foundries 1949	Magnesium Foundries 1951	Centrifugal Casting Producers 1951	Permanent Mold Casting Producers 1951	Pattern Shops 1951	Machine Shops 1951	Laboratories 1951
Alabama	99	105	84	92	5	5	3	2	33	39	10	16	17	28	36	..	10	8	84	83	50
Arizona	5	6	4	5	3	1	..	..	2	4	..	2	2	1	3	..	..	..	4	4	3
Arkansas	16	17	13	13	1	1	..	..	8	7	1	3	5	8	7	..	1	2	11	13	10
California	421	422	139	147	35	32	10	3	297	300	224	194	205	257	264	21	25	70	325	301	239
Colorado	46	47	21	27	5	5	..	..	28	24	21	23	22	27	22	1	..	11	36	35	26
Connecticut	144	135	53	55	6	3	6	7	103	95	75	86	77	80	74	3	2	15	107	101	77
Delaware	9	10	3	4	3	3	1	1	5	5	3	5	5	3	3	..	..	..	9	9	6
Dist. of Columbia	2	2	2	2	2	2	1	..	2	2	..	2	2	2	2	1	1	..	2	2	2
Florida	44	43	17	25	1	2	1	1	40	39	21	29	31	38	37	1	1	11	39	37	25
Georgia	74	78	56	61	4	4	..	..	39	39	11	31	37	35	35	2	2	8	69	61	41
Idaho	6	8	6	7	..	..	..	..	4	4	..	4	4	3	4	..	..	1	5	6	2
Illinois	441	452	186	207	30	32	20	20	233	248	183	158	174	201	219	12	11	49	332	306	237
Indiana	248	263	127	143	8	10	8	8	122	141	90	87	106	99	122	8	7	29	183	169	129
Iowa	94	95	59	65	3	1	1	1	46	51	28	31	30	40	47	2	1	9	73	71	46
Kansas	53	51	32	41	3	1	1	..	25	28	16	15	20	21	25	2	1	4	42	36	23
Kentucky	34	38	21	26	1	2	..	..	19	22	8	18	20	13	19	2	..	..	26	25	18
Louisiana	31	33	20	23	5	5	..	..	18	20	7	18	20	14	18	..	..	2	26	20	16
Maine	25	25	20	21	..	..	1	..	20	16	5	19	16	16	13	1	..	..	23	21	11
Maryland	39	40	20	21	2	2	..	1	25	27	13	23	26	18	21	..	3	..	35	32	22
Massachusetts	222	229	99	115	14	11	5	6	137	148	85	126	137	116	123	8	8	16	160	146	113
Michigan	370	383	171	188	25	26	10	12	201	211	154	147	163	155	171	12	19	53	279	264	209
Minnesota	102	106	60	67	4	3	1	1	46	56	29	37	44	42	51	2	1	12	77	74	55
Mississippi	10	10	10	10	..	..	1	..	4	5	..	4	5	2	2	..	..	..	7	9	5
Missouri	128	115	44	49	10	10	1	1	83	66	70	58	52	75	60	3	1	21	101	91	66
Montana	6	5	5	5	..	..	..	..	4	4	..	4	4	2	3	..	..	1	4	5	3
Nebraska	25	26	15	16	1	1	..	..	18	20	7	13	17	16	16	1	1	5	20	20	10
Nevada	3	3	2	1	2	1	..	..	1	2	..	1	2	1	1	..	..	1	3	1	3
New Hampshire	26	28	17	18	2	4	1	1	17	15	7	16	15	15	14	..	2	1	26	21	16
New Jersey	204	204	85	89	16	13	5	3	129	141	90	112	126	108	121	8	8	18	151	147	114
New Mexico	4	4	1	1	..	..	..	..	3	4	2	2	3	3	4	..	..	..	3	3	..
New York	405	388	169	174	26	23	12	13	266	270	182	213	221	233	235	11	14	42	316	293	214
North Carolina	69	67	56	56	..	..	..	..	48	41	12	41	35	44	39	1	..	1	61	55	35
North Dakota	3	3	3	3	..	..	..	..	2	3	..	2	2	2	3	..	..	..	3	3	1
Ohio	561	585	241	285	32	38	20	23	321	320	240	216	234	257	286	16	20	66	419	389	318
Oklahoma	41	42	26	28	2	1	1	..	26	23	13	17	16	23	22	5	..	2	36	34	25
Oregon	61	59	36	39	7	7	..	..	33	30	17	32	29	28	23	2	1	3	44	43	34
Pennsylvania	517	546	295	321	64	64	17	15	264	286	149	224	238	203	228	11	20	29	421	397	286
Rhode Island	37	40	14	17	..	..	1	3	19	24	16	18	22	18	23	..	..	3	34	28	23
South Carolina	24	24	20	22	1	..	..	..	17	18	3	17	17	15	13	1	..	1	21	20	14
South Dakota	3	3	3	3	..	..	..	..	2	2	..	1	1	2	2	..	..	1	3	3	3
Tennessee	75	77	63	68	3	3	..	..	32	38	10	27	31	28	32	1	2	6	68	63	44
Texas	131	133	73	75	11	11	1	1	79	91	42	65	77	66	76	7	6	12	100	98	72
Utah	19	18	15	13	2	2	..	..	6	10	2	5	9	6	8	1	2	3	14	14	9
Vermont	20	20	15	15	..	..	..	..	9	8	5	7	6	8	7	..	..	..	20	19	11
Virginia	64	68	55	61	5	5	1	..	41	47	7	37	41	36	40	4	2	3	55	53	35
Washington	75	81	39	44	17	16	1	2	50	58	27	43	48	42	53	4	3	5	61	54	40
West Virginia	38	39	20	23	3	2	1	1	22	26	13	20	22	17	17	..	4	2	33	30	21
Wisconsin	224	226	123	125	13	16	12	12	113	119	71	91	99	97	104	6	10	26	163	160	138
Wyoming	1	2	1	1	..	..	..	..	1	2	..	1	2	1	2	..	..	..	1	1	1
Total	5299	5404	2659	2917	377	368	144	138	3063	3199	1969	2361	2537	2565	2750	160	189	552	4135	3870	2901
Canada	568	570	367	372	33	38	17	16	365	377	155	286	298	323	333	12	11	61	488	485	331
U.S. & Canada	5867	5974	3026	3289	410	406	161	154	3328	3576	2124	2647	2835	2888	3083	172	200	613	4623	4355	3232

QUESTIONS and

Blows Caused by Steel Insert

Q.—We are making an aluminum alloy casting which in the rough weighs 140 lb, and 70 lb finished. Flask size is 27 x 54 x 12 in. for cope and drag. Core weight is 300 lb, and mold is green sand of AFS fineness 100, mainly on three screens. A straight steel tube 1 in. in diam is cast in the cope wall, and we have encountered a high percentage of blows in that area. While they do not scrap the casting, we would like to eliminate the trouble, and would like suggestions on how it may be accomplished.

A.—Difficulty often is encountered when metal inserts are made an integral part of a casting, and the major causes are dirty inserts and condensed moisture. By dirty inserts we mean those showing presence of oil, grease or oxide films which tend to generate gases when struck by the molten metal. To insure that the metal insert is clean it should be abrasive-blasted shortly before use, and handled so that it remains that way until placed in the mold.

To prevent condensation of moisture the insert always should be slightly warmer than the sand in the mold, and where possible it is preferable to place the insert in the mold just prior to closing and pouring. If this is not practicable, the next best thing is to put in the insert and leave the mold open until just before pouring.

We believe that if you will see that the steel tube is perfectly clean and free from moisture previous to contact with molten metal, you can eliminate trouble from blows.

To Raise the Silicon Content

Q.—For some time we have been working with only half our actual requirements of pig iron. Now we are informed that the furnace which supplies us is shutting down for repairs. We will get no pig iron for at least two months. We have tried other sources of supply, but without success. We make very small castings. Many have been rejected recently on account of hardness. We have been adding 50 per cent ferrosilicon to the scrap charge. It does not seem to help so far as hardness is concerned and besides it seems to make the iron dirty.

A.—By melting a judicious selection of suitable scrap a foundryman can produce acceptable castings. However, the problem becomes increasingly acute with reduction in casting weight and thickness. Iron quite suitable in a casting 2 in. thick, would not pass inspection in a casting ⅛-in. thick. Where a slight addition of ferrosilicon to the charge might bring a thick casting to the desired degree of machinability, a much larger amount of ferrosilicon would be required to produce the same effect in a thin casting.

Your comment that the addition of 50 per cent ferrosilicon does not produce the desired result would seem to indicate that the present addition should be increased, or that an alloy with a higher silicon content should be substituted. Your further statement that the addition of ferrosilicon produces dirty iron inclines us to the opinion that you are adding the alloy to the metal in the ladle, instead of adding it to the charge in the cupola, or in the stream flowing through the cupola spout. Addition to metal in the ladle lowers the temperature and if the addition is large it may not all dissolve. A satisfactory method of raising the silicon content to any desired point is by adding prepared silicon briquets or high-silicon silvery pig iron to the cupola charge.

Modify Structural Formation

Q.—We are forwarding a finished tube gear for textile machinery which shows porosity on the interior of the tube. We have cast this with the machined and polished face in both cope and drag, using cores to form the tube section. The entire casting has been made in dry sand cores, and also poured at all angles without satisfactory results. However, our best results were obtained by using 1½ per cent Ni. Since nickel no longer is available in quantities, can you make any suggestions?

A.—Examination of the polished surface of the tube gear casting with a low-power (4X) magnifying glass revealed numerous very fine pinholes. This, plus your description of the various methods tried to remedy the trouble, led us to the opinion that the underlying cause was in the structural formation. This was confirmed on fracturing the casting.

Fractured surfaces in general exhibited a shiny, black, somewhat open structure indicative of coarse graphite separation. In machining, those flakes tend to tear out, leaving pit-like depressions. When machining with fine cuts and fine feeds this condition is less obvious than with rough cuts and coarse feeds. Additionally, polishing the machined faces results in a smearing action which partially or completely closes the fine holes.

Remedy for the situation is to change the composition to decrease the degree of graphitization. This may be accomplished by reducing the silicon content of the iron, or by adding carbide stabilizing agents to the present composition. We suspect that you are using one composition to pour a variety of castings which come under the category of "easy machining", hence you will have to modify the effect of composition by ladle additions of a carbide stabilizer. Elements having that property are chromium, vanadium, manganese over 1 per cent, boron, and tellurium. Molybdenum is a mild carbide former.

nswers

Since boron and tellurium are extremely potent carbide stabilizers their use primarily is for production of white fracture irons. While chromium and vanadium are not as powerful, they exert a rather strong carbide stabilizing effect, and careless application will result in hard corners and edges, chilled areas, difficult machining, etc. Without knowledge of your present composition, it is difficult to suggest the amounts of the various elements to add to the ladle, but you might try the following: 0.15 to 0.20 per cent Cr; 0.05 to 0.10 per cent V; 0.25 to 0.30 per cent Mo. Carbide stabilizing effect of those elements may be modified by conjunctive use of a graphitizing agent such as copper, titanium, etc. Also you might try 0.5 per cent addition of an alloy containing chromium-silicon-manganese. Naturally, careful record should be made of surface appearance, machinability and other factors before and after various additions.

During the experimental work, and later for control purposes, we strongly recommend use of a wedge bar. As the name indicates, it has a triangular cross section, and the base may be 1 in. tapering uniformly to a feather edge in 5 or 5½ in. Width of the bar may be 2½ to 3 in., and preferably it is made in baked core sand molds to eliminate the moisture variable. Bar is split or broken longitudinally across the 3 x 5-in. face to reveal the depth or length of chill from the tip. Those data are correlated with the results obtained in the castings before and after making additions. Hence, by observing the depth of chill before making the addition, the amount may be varied to bring the results within the desired scope.

Pouring System Is Automatic

Q.—During a discussion at a recent meeting on the subject of pouring metal, a member mentioned the practice in a prominent midwest foundry where auto cylinder blocks are cast according to a method wholly automatic and a very close approach to perpetual motion. Unfortunately, the member was somewhat vague on details of construction and operation. If you are familiar with the installation we shall appreciate your kindness in supplying a brief description.

A.—The practice to which you refer was in force several years ago and still is in use as far as we know.

From the molding station the molds move on a conveyor past the pouring station. An oblong pouring ladle, with a spout at the side near one end and supported on end trunnions, is mounted on a car alongside the mold conveyor. The car moves backward and forward under the furnace spout. When the mold arrives, the ladle tips forward and a stream of metal enters the pouring basin on top of the cope. Mold and ladle travel at the same speed side by side. By the time they travel the length of the ladle, the mold is filled. The ladle automatically tips back to a horizontal position and the car carries it back to the original position. By this time another mold has arrived and the sequence is repeated. Metal from the furnace flows continuously into the pouring ladle. The furnace is not a melting furnace. It is a 20-ton receiver or holding device into which metal is poured at the back, kept at proper temperature and discharged through a carefully calibrated tap hole into the pouring ladle. Obviously everything is synchronized on a split second schedule.

Ball Castings Stick to Molds

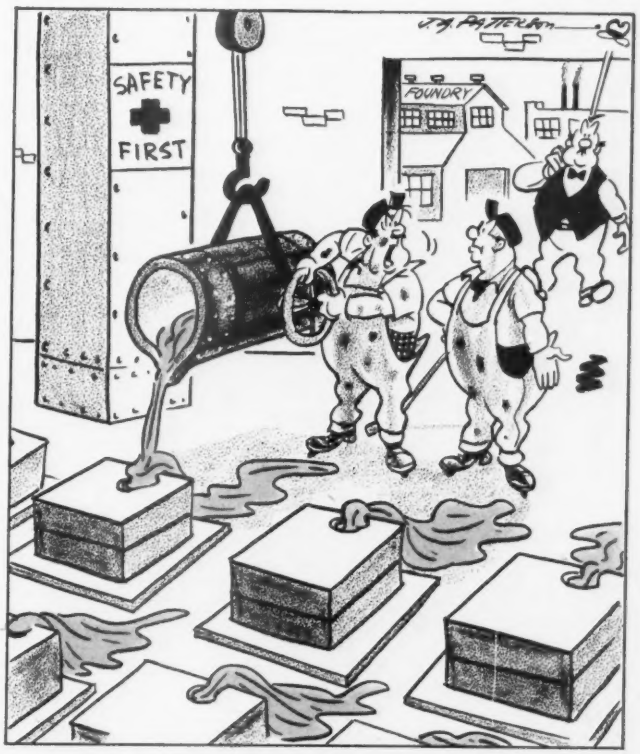
Q.—We make white iron ball castings for grinding ore in revolving mills. The gray iron molds in which the balls are cast are water cooled. Each time the mold is used we paint the face with a thin plumbago wash. In many instances the castings stick to the molds and we have considerable difficulty in removing them. We shall appreciate your opinion on this subject.

A.—We are inclined to the opinion that the metal section in your water cooled molds is too thin and therefore heats up too rapidly in spite of the water cooling system. The molten metal sticks to the hot walls. In instances of this kind with which we are more or less familiar, the gray iron molds are heavy, solid blocks with no water cooling attachments.

An interesting and complete descriptive article on the production of white iron balls at the plant of the Nevada Consolidated Co., Ely, Nev., was published several years ago in FOUNDRY. Later in the same year another article described the methods and equipment for producing white iron balls from steel scrap at the plant of the Utah Copper Co., Garfield, Utah.

GANGWAY!

By J. A. PATTERSON



"So what? None of us are perfect, are we?"

QUESTIONS *and Answers*

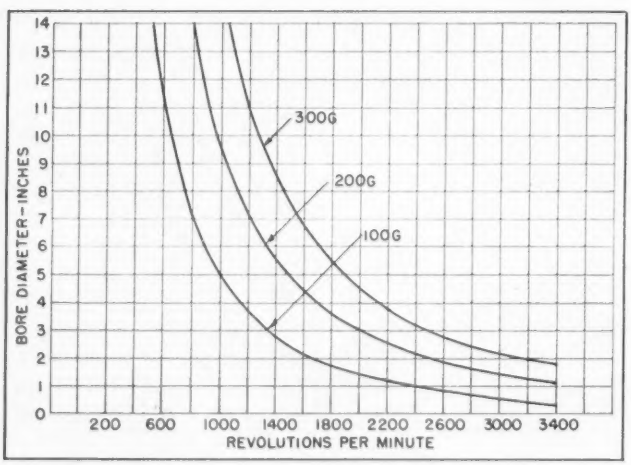
In each of these instances the molds are solid slabs split vertically instead of in the usual horizontal manner. One half is attached firmly to a foundation. The other half is moved into open or closed position by a plunger rod actuated by pneumatic, hydraulic or steam pressure. The massive mold absorbs and dissipates the heat so that at no time is the face hot enough to cause the castings to stick. A more recent article in the March, 1950 issue of FOUNDRY described continuous production of cast grinding balls in water-cooled copper molds.

Centrifugally Cast Bushings

Q.—We would like to know if you have any information on spinning bronze bushings which you can send to us.

A.—Application of the centrifugal casting process to manufacture bushings and other types of nonferrous castings has been described in the literature, and if your public library contains bound volumes of FOUNDRY, you will find considerable information in the October, 1942 issue in an article entitled "Producing Nonferrous Castings Centrifugally" by H. J. Zuehlke. Briefly the molds may be gray cast iron, graphite, sand-lined metal molds, or dried core sand molds, but in the case of bushings the first two are preferable.

Molds may be rotated on the vertical axis, on the horizontal axis, or on some angle between the two. Generally bushings are spun at an angle of 45° from the horizontal, and the machines usually are arranged so that the angle may be varied when required. With metal or graphite molds the taper, for easy removal of the casting, may vary from ⅛ to 3/16-in. per ft of length; for the same purpose as well as to protect the mold face, a thin coating of dry bentonite is blown on the wall with a spray gun. Centrifugal force of the spinning mold holds it in place.



Graph showing relationship of bore diameter and spinning speed

Opinions as to the speed of rotation of the molds vary, but Zuehlke states that he found most satisfactory results when the centrifugal force was one hundred times gravity in the case of bushings and similar castings, and developed a chart for speeds for producing bushings of various bore diameters as shown in the accompanying sketch. He points out that the chart or graph should be used only for thin-wall pieces; if large flanges are involved, the speed must be decreased to a safe figure.

Pouring Temperature Too High

Q.—We are enclosing a section of a bronze valve we manufacture. We have made these for some time and have had very little difficulty, but recently we have come up against a number of leakers due to porosity. We cut up one and it does show a defective streak as you will note. We would like your opinion on the cause of the trouble. We buy standard 85-5-5-5 ingot, and these valves were made from a new lot of metal.

A.—The discolored defective streak you mention is termed interdendritic shrinkage porosity, and probably is the result of pouring at too high a temperature as well as the presence of gas in the alloy. Those two often go hand in hand since high temperatures are conducive to greater gas absorption. Pouring range of the 85-5-5-5 alloy is given as 1950 to 2250°F depending upon section thickness. However, the best pouring range for a particular casting should be determined experimentally, and instructions issued to stay within that range.

Possibly the gates into the castings are a little too small, and from time to time trouble is encountered with cold shuts. To avoid this the metal may be poured at a higher temperature with a tendency to go too high. Experimentally you might try increasing the size of the gates slightly with clay, plaster, plasticene, etc., and see what results are obtained, particularly with reference to pouring temperature. If favorable, then a permanent change is advisable.

Path of Cam Must Resist Wear

Q.—In our foundry in Italy we are making a gray iron cam 16 in. in diam which must have good wear resistance on both sides of the grooved traveler path located on the face of the casting. Composition of the iron shows 2.70 to 3.10 per cent TC, 1.40 to 1.80 per cent Si, 0.40 to 0.80 per cent Mn, 1.50 to 2.00 per cent Ni, 0.40 to 0.60 per cent Cr, 0.20 per cent P max., and 0.10 per cent S max. Metal is melted in an electric furnace using an electric resistance slag.

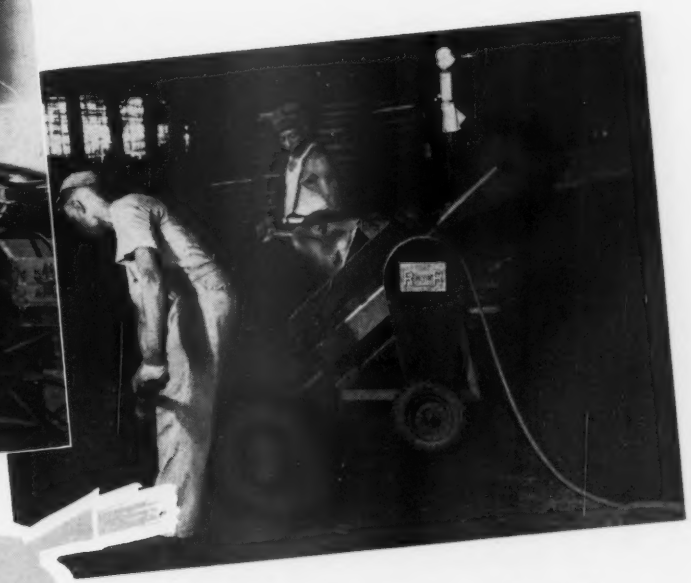
A.—As far as composition of your cam casting is concerned, we believe that it should show good wear resistance. Possibly by making a slight change in analysis to accommodate some molybdenum, an improvement may result. For example, you could try 1.40 to 1.60 per cent Ni, 0.35 to 0.50 per cent Cr and 0.40 to 0.60 per cent Mo.

It appears to us that the wear resistance of the casting could be increased considerably by heat treatment—but possibly the shape of the casting might be such that trouble might be encountered in distortion

(*Concluded on page* 108)

WHATEVER YOU POUR.... IT'S ALL THE SAME TO A ROYER

NON-FERROUS METAL



MALLEABLE IRON

Royer Sand Separators and Blenders are made in ten standard stationary and portable models—suitable to meet the requirements of any foundry. Portable models are mounted on rubber tired wheels for easy movement from place to place. Capacities range from 4 to 50 tons of sand per hour. Write for complete details today.

GREY IRON

Grey iron, malleable, steel, non-ferrous . . . whatever you pour you will get cleaner, smoother finished castings with Royer prepared molding sand. Blows, scabs and runouts are largely eliminated and machining and grinding time is greatly reduced.

More than 8000 Royer Sand Separators and Blenders are working in foundries all over the world—production and jobbing—furnishing evenly blended, completely aerated, refuse-free molding sand. And at a saving in costs, too . . . one or two men and a Royer can condition enough sand in minutes to supply a molding crew for hours . . . users report savings up to 50% in labor costs alone.

Everybody profits when you use a Royer . . . your help will appreciate the elimination of much of the back-breaking labor . . . your customers will be pleased with the improvement in casting quality . . . and your cost sheets will show a profit for you.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

QUESTIONS *and Answers*

(*Concluded from page* 106)

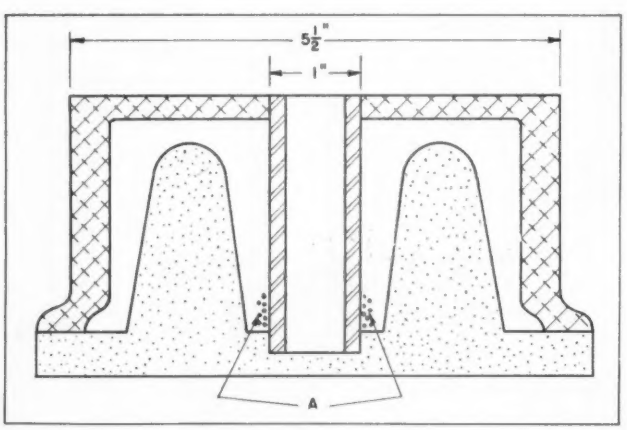
or cracking. However, it would be worth a trial to heat to 1550°F (845°C), oil quench, and draw or temper at 350 to 400°F (180 to 205°C).

A better procedure, if equipment is available, would be to harden only the particular areas involved. By equipment we refer to an oxyacetylene torch and water spray quench which commonly is called "flame hardening." However, shape of the area to be hardened would involve special equipment such as a follower to keep the torch in the proper path, and a special narrow head on the torch to heat both sides of the groove simultaneously.

Casting Blows Near Steel Tube

Q.—We are having trouble with a small aluminum hub casting as shown in the accompanying sketch. A piece of steel tubing is placed in the center instead of a sand core. The castings are perfect with the exception of a small porous area *A* around the bottom of the tube. We have tried several methods to prevent this condition, but without effect. We shall appreciate any suggestion.

A.—You do not state whether the mold is green sand or dry sand. From the general appearance we are inclined to the opinion that the mold is a two-piece dry sand core. On this assumption and the fact that the defect appears only near one end of the tube, it is apparent that the tube is not responsible for the defect. You do not specify what preventive measures you have tried, therefore we may or may not be right in our diagnosis. Basing an opinion entirely on the sketch and your description we should say your trouble is caused by a point frequently overlooked. If the two cores are joined by a small dab of paste, it is probable that the paste is not thoroughly dried when the core mold is filled with metal. A small amount of steam is developed and is trapped by the metal which solidifies rapidly in the narrow space. The obvious remedy is either to omit the paste or give the assembled core another pass through the oven.



If the mold is a two-piece core, defect is caused by wet paste at joint

Use of Wedge Gate Suggested

Q.—We have run into difficulty with gray iron stovelids for our coal and wood stoves. The sand seems to be cutting at the gates, and if we pour with cooler iron it will not run through the lifter tins. Hot iron cuts the sand at the gate and carries sand on to the face of the lid. We have tried two types of gates. Both are finger type; one has two branches and the other four, but neither is satisfactory. Molding sand works well with the rest of our stoveplate jobs. All sand is conditioned and rammed by hand.

A.—It appears to us that the most satisfactory gating method for stovelids is that commonly practiced in stoveplate molding—the wedge gate. Mold the lids face down and attach the gate to the center of the cope side. Gate can be 4 in. long, ⅛-in. thick where it is attached to the lid, and tapering up to ¾-in. wide at the top. Possibly with experiment the thickness of the wedge gate can be reduced. Pour the castings hard and quick. Blow from the hammer should remove the gate from the lid, leaving only a trace of the attachment.

Gas in Metal Causes Pin Holes

Q.—We are sending to you samples of split lugs of split, chilled rim sprockets we are making, and you can see the numerous holes they contain. Chills for the rim are dry, the cores are dry and not too hard. The sand was a little wet, but it is our opinion that the holes are not all due to the sand, and would like your ideas as to the cause. Iron was quite hot, but not white hot.

A.—Appearance of the holes with their bright, shiny surfaces indicates that they are caused by gas in the metal, and we suspect that either the spout from the cupola, or the lining of the ladle was not dried thoroughly prior to use. Moisture in the refractory at high temperature of the iron is turned into water vapor, and perhaps dissociated into its components hydrogen and oxygen. Those gases are held in solution until freezing begins. However, by that time a thick skin has formed next to the mold interface, and the gases, being unable to escape, form the holes.

Cores Are Most Likely Cause

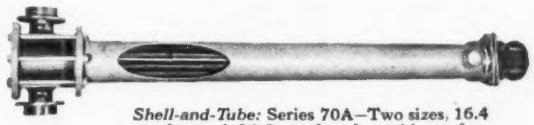
Q.—Our automobile engine pistons are molded in green sand with dry sand cores. A considerable number of the castings crack in the skirt. Do you think our iron containing from 0.70 to 0.80 per cent phosphorus is responsible?

A.—The comparatively high phosphorus content may be a minor factor. In regular automobile foundries the phosphorus content runs between 0.20 and 0.30. You do not give as much detail as we would like to have, but from considerable former experience we are inclined to the opinion that the cores are too hard. They do not collapse readily while the casting is contracting. On a thicker casting the strain might be absorbed, but the thin wall of the piston is not strong enough to resist the strain.

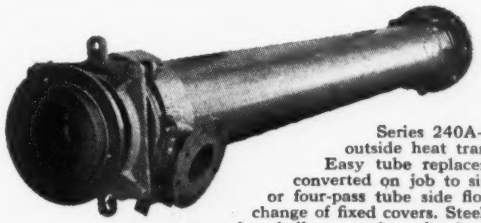
"KARBATE" BRAND IMPERVIOUS GRAPHITE HEAT EXCHANGERS *FOR ALL PURPOSES!*

The "Karbate" impervious graphite heat exchangers illustrated are used extensively as boilers, coolers, condensers, vaporizers, evaporators, heaters and absorbers in handling corrosive chemicals, either hot or cold. They *all* can be had in a complete size range. *All of them* offer the following advantages:

- **Highest heat conductivity rate of the practical corrosion-resistant materials.**
- **Highly resistant to corrosion by acids or alkalis, hot or cold.**
- **Freedom from corrosion scale, as compared to metals.**
- **Immune to thermal shock.**
- **No contamination of product.**
- **Strong and easy to install and maintain.**



Shell-and-Tube: Series 70A—Two sizes, 16.4 sq. ft., and 24.6 sq. ft. of outside surface area respectively. Tubes easily replaced in the field. Interchangeable single and double-pass construction.



Series 240A—70.6 feet of outside heat transfer surface. Easy tube replacement. Easily converted on job to single, double, or four-pass tube side flow by simple change of fixed covers. Steel, shell, oversize shell connections, impingement plates and drain and vent plugs integral with shell end castings. Stainless-steel baffles assembled with steel tie rods to form protective cage for tube bundle. Removable "Karbate" tube bundle. Write for catalog sections for S-6690, S-6715 for details of applications, maintenance, sizes and characteristics of these exchangers.

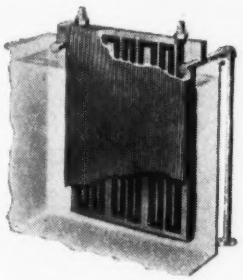
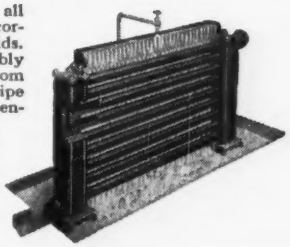
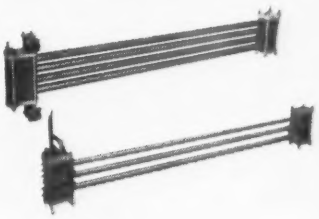


Plate heaters: Used to heat or cool corrosive liquids in tanks and vessels. Compact, completely assembled, easy to put in. Used in pickling, etching, plating and cleaning tanks. Complete size range. Models for horizontal and vertical mounting. Write for catalog section S-6620.

Style FH heat exchangers (Size 1½): Are especially recommended for tanks with solution depths of 16 inches or less. Write for catalog section S-6750.

Cascade coolers: For all cooling jobs involving corrosive gases and liquids. Complete cooler assembly may be made quickly from 4 standard items in 5 pipe sizes. Capacity easily enlarged or reduced by adding or subtracting standard sections. Compact construction to save plant room. No special supporting structure needed. Write for catalog section S-6780.





Concentric Tube exchangers: Available in two types. Series 10A is small, low-priced, gives true counterflow. Exceptionally good for small flow rates at narrow temperature differences . . . Series 20A manufactured with "Karbate" inner and outer piping, and is used to transfer heat between two corrosive fluids. Both have sectional construction, can be added to or subtracted from at will. Sturdy, can be moved from place to place after assembly, adapted to any method of mounting on floor, wall, or ceiling. Write for catalog section S-6670.

The term "Karbate" is a registered trade-mark of Union Carbide and Carbon Corporation

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A Division of Union Carbide and Carbon Corporation
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District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited
Montreal, Toronto, Winnipeg

A full line of "Karbate" impervious graphite pipe and fittings

for conveying corrosive chemicals includes: "Karbate" pumps of advanced design embodying impervious graphite case, impeller, and a rotary seal which eliminates the stuffing box. Pump prices reduced up to 33%. Write for catalog section S-7000 for pipe information, S-7200 for pump information.

MEN

of Industry

THOMAS E. EAGAN has been named research metallurgist, a new position created by Cooper-Bessemer Corp., Mt. Vernon, O., for further development in the field of nodular iron and other engineeering metals. Mr. Eagan was graduated from Columbia University and received a metallurgical engineering degree from Missouri School of Mines in 1928. He was associated with Simonds Saw & Steel Co., Lockport, N. Y., Crucible Steel Co., Harrison, N. J., and Midvale Co., Philadelphia, in research work, prior to joining Cooper-Bessemer Corp. in 1934. A national director of the American Foundrymen's Society, he is also active in committee work in American Society for Testing Materials and Society of Automotive Engineers. **W. R. McCracken** has assumed Mr. Eagan's former duties in charge of the company's foundry research laboratories in Grove City, Pa., and will also supervise materials control of foundry operations there and in Mt. Vernon.

♦ ♦ ♦

G. O. Loach has been named director and vice president, Electro Metallurgical Co. of Canada Ltd., Welland, Ont. Mr. Loach has been associated with sales and techincal service activities of the company since 1945. Prior to that he held technical and supervisory positions with several foundries and steel mills.

♦ ♦ ♦

P. M. Fleming has been named president, Pittsburgh Rolls Division, and **S. J. Moran,** president, Union Steel Castings Division, Blaw-Knox Co., Pittsburgh. Mr. Fleming joined the division in 1913, supplementing his service in cost, order, accounting and sales departments with night school courses at Duquesne University. He became secretary and assistant treasurer in 1917, vice president-sales in 1937, and has managed the division for the past year. Mr. Moran, who joined Union Steel Castings Division in 1920, also attended Duquesne University at night and has served as purchasing agent, office manager, production manager and works manager of the division. During the past year he has been general superintendent.

♦ ♦ ♦

I. Melville Stein has been elected executive vice president, Leeds & Northrup Co., Philadelphia. Mr. Stein, who attended Columbia University, joined the company in 1919. He became research director in 1928, and vice president in charge research in 1944.

♦ ♦ ♦

Dr. George J. Goepfert has been appointed director of research for Speer Carbon Co., St. Mary's Pa., and its subsidiary, the International Graphite & Electrode Corp. A graduate of Fordham University, Dr. Goepfert was formerly supervising engineer of the organic chemical laboratory of the Research and Development Division, the Carborundum Co., Niagara Falls, N. Y.

♦ ♦ ♦

P. M. Budge, formerly associated with Aluminum Co. of America, has been named foundry superintendent, Shoe Hardware Division, U. S. Rubber Co., Waterbury, Conn. A graduate of University of Michigan, Mr. Budge was chief metallurgist at the Fairfield and Bridgeport, Conn., plants of Aluminum Co. and more recently research metallurgist at the New Kensington, Pa., laboratories.

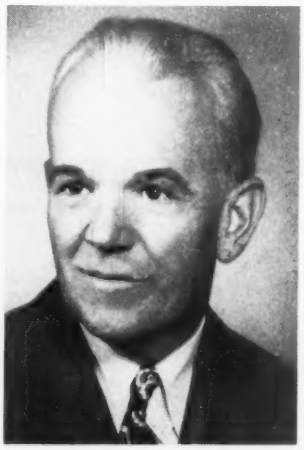
♦ ♦ ♦

A. W. Winston, formerly executive assistant, has been named assistant manager of the magnesium department, the Dow Chemical Co., Midland, Mich., with special responsibilities in business analysis, pricing, marketing and sales. Mr. Winston joined the company in 1920 and has served as metallurgist, experimental engineer, plant superintendent, director of the magnesium laboratory staff and in developing expanded plant fa-

(*Continued on page* 112)

THOMAS E. EAGAN
. . . *research, Cooper-Bessemer*

G. O. LOACH
. . . *v. p., Electro Metallurgical*



P. M. FLEMING
. . . *pres., Pittsburgh Rolls Div.*

S. J. MORAN
. . . *pres., Union Steel*

METAL BLAST SHOT AND GRIT has MORE than modern dress

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ANNEALSHOT — The finest *hard* shot and grit made, but sells at chilled shot prices.

SUPER-ANNEALSHOT — The perfect *malleable* shot and grit.

MEN *of Industry*

(*Continued from page* 110)

cilities. Since 1945 he has been executive assistant to the manager of the magnesium department. Mr. Winston has been president of the Magnesium Association for the last two years.

♦ ♦ ♦

George E. Tisdale, secretary-treasurer, Zenith Foundry Co., West Allis, Wis., has been elected president of the Wisconsin Chapter of the American Foundrymen's Society for 1951-52. Mr. Tisdale joined Zenith Foundry in 1926 as accountant-purchasing agent, following extension courses at Universiy of Wisconsin. He became secretary-treasurer of the company in 1939. Active in the AFS, he is secretary of its Foundry Cost Committee and has also served as a national director of Gray Iron Founders' Society.

♦ ♦ ♦

William T. McGinnis has been appointed assistant to the president and **L. W. Coquillette,** assistant to the vice president, Keokuk Electro-Metals Co., Keokuk, Iowa. Mr. McGinnis was formerly manager and vice president, Pacific Northwest Alloys Inc., Spokane. Previously he was with Southern Service Corp., California, and director of the Industrial Division, War Assets Administration, Seattle. Mr. Coquillette was formerly manager of the Keokuk office of McGladrey, Hansen & Dunn Co., accountants. **G. L. Weissenburger** was re-elected president and treasurer of Keokuk Electro-Metals Co. Other officers re-elected include: **J. W. Miller,** vice president; **Edward H. Fries,** vice president-secretary; **L. E. Othmer,** vice president-operations; and **C. W. Hiserote,** assistant secretary and assistant treasurer.

♦ ♦ ♦

Capt. Richard H. Lambert, formerly head of the Welding and Casting Branch, Ship Technical Division, Navy Bureau of Ships, has been named shop superintendent, U. S. Navy Yard, Philadelphia. **Lt. Comdr. M. N. P. Hinkamp** has succeeded Capt. Lambert as head of the Welding and Casting Branch, and **Lt. F. L. Doty** has been named assistant to Lt. Comdr. Hinkamp. **Lt. Comdr. John B. Guerry** has been named to take over Capt. Lambert's former duties as assistant for metallurgy, Materials Development Division, Bureau of Ships. All of these officers have taken postgraduate courses at Carnegie Institute of Technology following graduation from Annapolis.

♦ ♦ ♦

A. C. Towne Jr. was recently elected president, Michigan Oven Co., Detroit. Mr. Towne, one of the company's founders, has been Buffalo district manager since incorporation two years ago. **William Jarvis,** for the past 7 years chief engineer, Detroit Sheet Metal Co., has been named general manager.

♦ ♦ ♦

George C. Evans has been appointed a supervisor, Electro-Alloys Divison, American Brake Shoe Co., Elyria. Mr. Evans was recently graduated from University of Michigan where he spent 2½ years in the foundry laboratory.

♦ ♦ ♦

Luke E. Sawyer, formerly executive vice president, has been elected president, Babcock & Wilcox Tube Co., Beaver Falls, Pa., succeeding **Alfred Iddles,** who has been named chairman of the board of directors. **Isaac Harter,** formerly chairman, has been made a consultant to the company, and **Edward A. Livingstone,** vice president sales, has been given broader organizational responsibilities.

♦ ♦ ♦

J. H. Redhead, president, Lake City Malleable Co., Cleveland, has been elected a trustee of Baldwin-Wallace College, Berea, O., his alma mater, to represent the Alumni Association on the board.

♦ ♦ ♦

I. W. Ferguson has been appointed manager of quality control, the Cooper-Bessemer Corp., Mt. Vernon, O. **E. C. Phelps** succeeds Mr. Ferguson as assistant works manager. **Harold Johnson** has been named factory superintendent and **Harry Cecsarini,** supervisor of the routing and estimating department.

♦ ♦ ♦

Carlton H. Rose, director of the specifications department, National Lead Co., Washington, has been awarded a certificate of service by the American Standards Association in recognition of his work in development of standards.

♦ ♦ ♦

Herbert B. Link since 1939 executive vice president, the Bellows Co., Akron, O., maker of pneumatic equipment, has been named president succeeding the late L. F. R. Bellows. Other officers recently elected include **L. F. R. Bellows Jr.,** Detroit, vice president, and **Byron D. Kuth,** Cleveland, secretary-treasurer.

♦ ♦ ♦

Erwin S. Mason Jr. has been appointed Cincinnati territory sales engineer for the Machinery Division, Dravo Corp., Pittsburgh. A graduate of Purdue University, Mr. Mason was formerly vice president-secretary Mason & Lowman Co., Cincinnati. He will handle sales of Dravo heaters

(*Continued on page* 115)

GEORGE E. TISDALE
. . . heads Wisconsin Chapter

WILLIAM T. McGINNIS
. . . joins Keokuk Electro-Metals

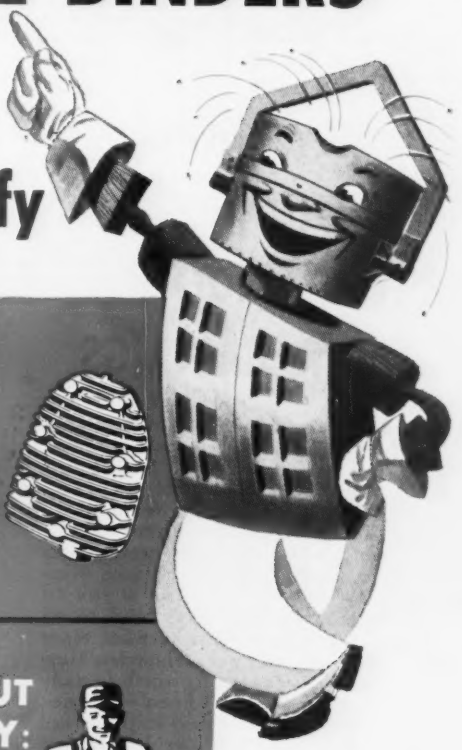
L. W. COQUILLETTE
. . . Keokuk Metals executive

G. L. WEISSENBURGER
. . . pres., Keokuk Electro-Metals

Charley the Core-Maker Says:

SPEED PRODUCTION WITH KRAUSE CEREAL BINDERS

Mix Quicker — Mold Faster
Collapse and shake out in a jiffy



MORE GREEN STRENGTH:

In both green and dry core stages there is greater binding strength with Truscor and Amerikor — they supply the needed green bond and strong affinity between sand granules.

FINER DETAIL:

Smooth surfaces — sharp, unbroken edges — less scabbing, cold shut, buckling — because Truscor and Amerikor are scientifically processed to provide these advantages.

FINE FLOWABILITY AND TEXTURE:

The uniform quality of Truscor and Amerikor insures quicker mix — easier blending — less sticking — uniform ramming — increased permeability.

EASY, BURN-OUT COLLAPSIBILITY:

Because cereal binder burns out rapidly and completely during casting, you are sure of ready collapsibility and easy shake out when you use Truscor or Amerikor.

For better, lower-cost cores, place a trial order for Krause Cereal Binders now — Truscor, if you like a light weight binder; Amerikor, if you prefer a heavier weight. Call any one of the distributors listed below or write us direct. **CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wisconsin.**

World's Largest Millers of Dry Corn

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A. L. Cavedo & Son, Inc.
Richmond 21, Va.

Foundry Supplies Co.
Chicago 16, Ill.

J. H. Hatten
Lansdowne, Pa.

Schuler Equipment Co.
Birmingham, Alabama

Independent Foundry Supply Co., Los Angeles 11, Calif.

Marthens & Co.
Moline, Illinois

Carl F. Miller & Co.
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Milwaukee Chaplet & Mfg. Co., Milwaukee 15, Wis.

Porter Warner Industries, Inc.
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Smith-Sharpe Co.
Minneapolis 14, Minn.

Snow & Galgiani
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San Francisco 7, California

Frederic B. Stevens, Inc.
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Frederic B. Stevens, Inc.
Cleveland 14, Ohio

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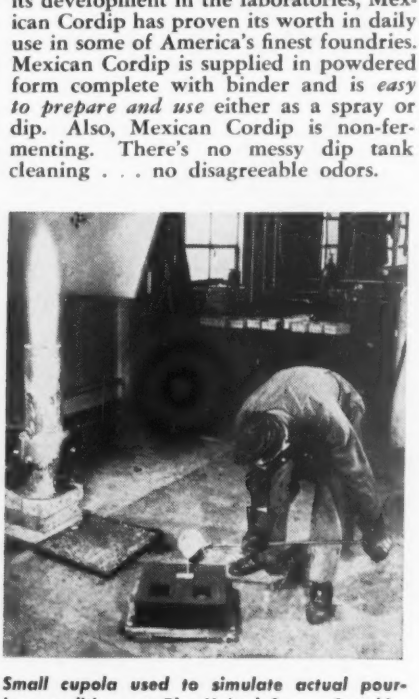
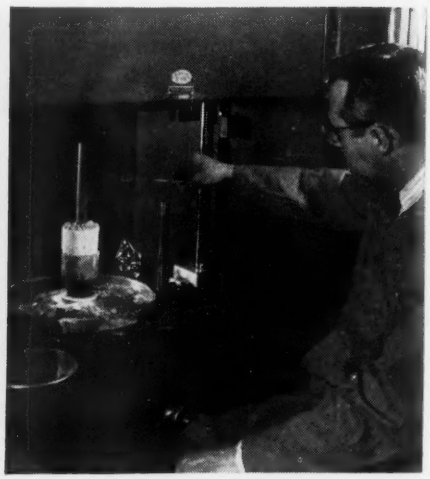
NEW NON-FERMENTING WASH GIVES SMOOTHER, TRUER CASTINGS

Mexican Cordip is just one of the many new products that are continually being developed by the research facilities of The United States Graphite Company. Mexican Cordip is a high temperature coating that gives castings maximum surface smoothness. Dry or green cores maintain true dimensions because Mexican Cordip *will not build up or run on core surfaces.* It penetrates sand to an effective depth to prevent burn-in. Since its development in the laboratories, Mexican Cordip has proven its worth in daily use in some of America's finest foundries. Mexican Cordip is supplied in powdered form complete with binder and is *easy to prepare and use* either as a spray or dip. Also, Mexican Cordip is non-fermenting. There's no messy dip tank cleaning . . . no disagreeable odors.



Small cupola used to simulate actual pouring conditions at The United States Graphite Company laboratory.



1⅛" cores with small cylindrical cavity being charged with metal (left) for insertion into the hot zone of the Dilatometer (right). Metal melts to form a small pellet. After cooling, the core and casting are studied for ease of removal, coating remaining, burn-in, and surface appearance.

MODERN LABORATORY DUPLICATES ACTUAL FOUNDRY CONDITIONS FOR BETTER PRODUCT RESEARCH

Old-time foundry men and newly graduated metallurgists alike who have visited The United States Graphite Company's neat, new foundry research laboratories in Saginaw have been enthusiastic about the completeness of the equipment, *the thoroughness of the tests*—and the extent to which the engineers here are going in order to develop even better Mexican Graphite products for America's foundries.

In this amazingly complete laboratory is a perfect little 4½" diameter cupola that exactly duplicates the results of its big brothers on production. An electric furnace and a Dilatometer are used to study the effect of temperatures up to 3000° F under just about any atmosphere. Metallurgical microscopes are used for closer study (up to 3,000 diameters) of the sand-metal interface of experimental cores and molds.

There is a core oven and complete sand testing equipment so that precise studies can be made of the penetration, effect on surface, and physical characteristic of sand when using various types of Mexican Graphite washes.

Within this modern laboratory there is even a chemical laboratory *fully equipped for making every kind of test and analysis* that is likely to apply to foundry products and foundry practice.

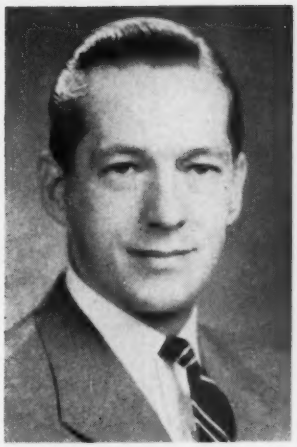
It is largely because of the completeness of this modern laboratory—and the skill, knowledge and creative ability of the engineers here that United States Graphite Company products are so effectively saving production time, cutting costs and helping to assure better castings in America's leading foundries today. *This laboratory is at your service.* Call or write us.

154-A

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

ROBERT F. GALVIN
. . . pres., Ohio Steel Foundry



CHARLES W. GUPTIL
. . . Eclipse Fuel Eng. Co. sales

EDWARD H. ROPER
. . . Air Reduction Sales mgr.

JOHN A. SHARRITTS
. . . foundry equipment, Cleveland

(*Continued from page* 112)
and products of DeLaval Steam Turbine Co., East Trenton, N. J., C. H. Wheeler Division of Hamilton Thomas Co., Philadelphia, the Fuller Co., Catasauqua, Pa., and Walker Process Equipment Inc., Philadelphia.

♦ ♦ ♦

Robert F. Galvin has been elected president, Ohio Steel Foundry Co., Lima, O., succeeding his father, **John E. Galvin,** president since 1918, who has become chairman of the board. Robert Galvin worked at the plant during summer vacations and, following graduation from Princeton University in 1939, became assistant to the vice president in charge of operations and vice president and director the following year. Other officers of Ohio Steel Foundry Co., recently elected, are: **T. H. Harvey** and **E. A. Walcher,** vice presidents, and **W. P. Dudley,** secretary-treasurer.

♦ ♦ ♦

Charles W. Guptil has been appointed representative in St. Paul for Eclipse Fuel Engineering Co., Rockford, Ill., succeeding **Henry E. Balsley,** retired, with whom he has been associated since 1949. Mr. Guptil, a graduate of University of Minnesota, was formerly with Bryant Heater Division, Affiliated Gas Equipment Inc., in Cleveland and St. Louis.

♦ ♦ ♦

Edward H. Roper has been appointed manager of the general technical sales department, Air Reduction Sales Co., New York. A graduate of Yale University, Mr. Roper joined Air Reduction in 1936 and served in various capacities in the general technical sales department, becoming assistant manager in 1948.

♦ ♦ ♦

John A. Sharritts has organized John A. Sharritts & Co., which has been named to succeed the late Russell F. Lincoln as manufacturer's agent for International Molding Machine Co., La Grange Park, Ill., Modern Equipment Co., Port Washington, Wis., and Claude B. Schneible Co., Detroit, with headquarters at 1273 West 108th St., Cleveland. Mr. Sharritts until recently was foundry superintendent at the Cleveland plant of Westinghouse Electric Corp., Pittsburgh. Prior to that he was associated with Ohio Steel Foundry Co., and Gorrel-Carnes Foundry, Lima, O., and Miami Foundry Co., Miamisburg, O.

♦ ♦ ♦

George C. Rodgers has been appointed manager of the Military Sales Department of the Herman Nelson Division, American Air Filter Co., Moline, Ill., where the company manufactures portable heating and ventilating devices. Mr. Rodgers was formerly associated with Berry Motors Inc., Corinth, Miss., and prior to that with Curtiss-Wright Corp. **Irving W. Clark** has been named manager of the Military and Special Contracts Department of the company in Louisville. Mr. Clark until recently was executive vice president, General Plywood Corp., Louisville. Previously he was with Great Lakes Steel Corp., Detroit and Westinghouse Electric Corp., Pittsburgh.

♦ ♦ ♦

H. J. Urbach has been named executive engineer, the Timken Roller Bearing Co., Canton, O. **C. M. Maratta** has been appointed chief consulting engineer, **L. A. Holder,** chief mechanical engineer, and **R. A. Schimpf,** chief works engineer.

♦ ♦ ♦

David C. Ekey has been appointed instructor in the Department of Industrial Engineering, Pennsylvania State College, where he will be in charge of the foundry option courses. He succeeds the late Clifford W. Morissette. Mr. Ekey is a graduate of Ohio State University and currently is completing work there for an advanced degree.

♦ ♦ ♦

Ernest Lux, until recently district sales manager in the New England territory, Dewalt Inc., Lancaster, Pa., maker of radial arm saws, has been named district sales manager in the Western Pennsylvania-West Virginia area. **James Carpenter,** formerly an executive of Carpenter & Powers, Boston, a DeWalt representative there, has succeeded Mr. Lux in the New England area.

♦ ♦ ♦

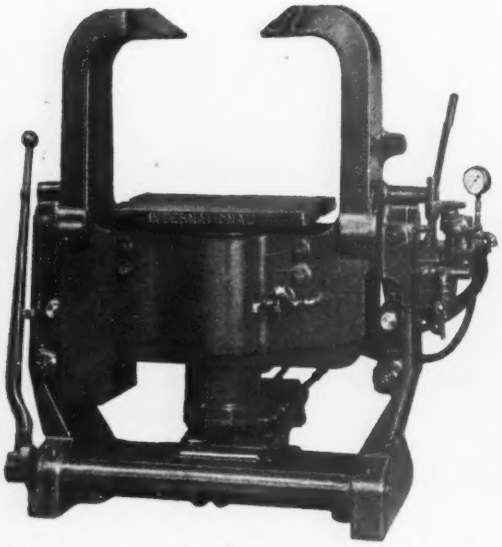
Dr. Gerhard J. Derge has been appointed to a new professorship in metallurgical engineering recently established at Carnegie Institute of Technology by a grant from Jones & Laughlin Steel Corp., Pittsburgh. Dr. Derge, a graduate of Amherst College, has been at Carnegie Institute since 1934.

♦ ♦ ♦

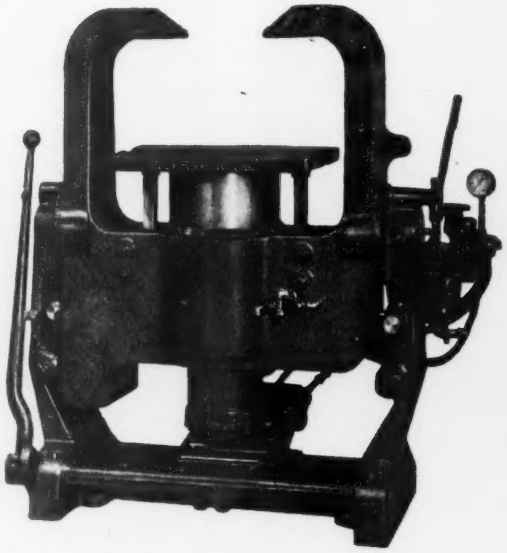
Thomas E. Akers has been elected president, Dominion Brake Shoe Co., Ltd., Montreal, succeeding **Maurice N. Trainer,** president since 1934, who has become chairman of the board. **Kenneth T. Fawcett** has been named vice president of the American Brakeblok and Kellogg divisions of the company. Mr. Akers, who joined American Brake Shoe, the parent company, in 1902, successively became president, Ramapo Ajax Division, president, Canadian Ramapo Division, and vice president, Dominion Brake Shoe. Mr. Trainer, for the past year president of American Brake Shoe Co., joined the company in 1916, following graduation from University of Pennsylvania. Mr. Fawcett, a graduate of Yale University in 1934, joined the company that year as an apprentice. He became vice presi-

(*Continued on page* 118)

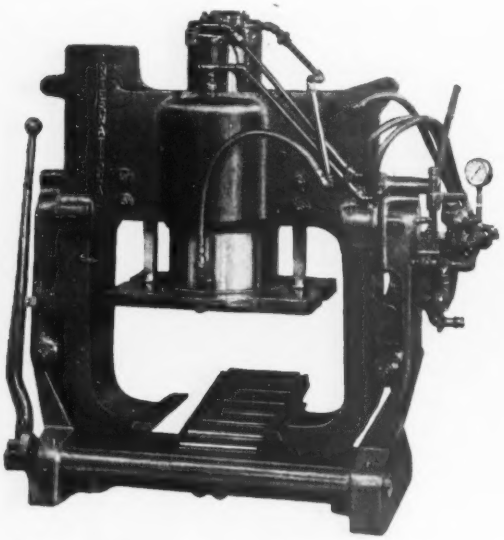
OPERATING CYCLE OF THE RES MACHINE



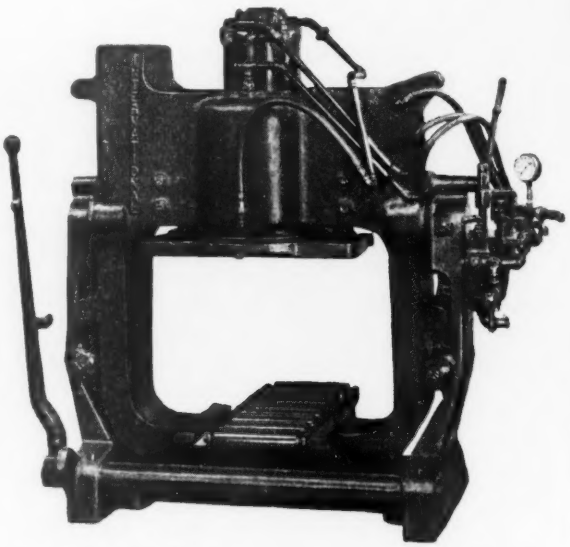
1 JOLTING POSITION . . . ready for flask, sand and jolting. Strike-off and place bottom board on sand.



2 SQUEEZE POSITION . . . actuation of squeeze valve raises squeeze piston, thereby squeezing the mold and clamping the bottom board and flask into one integral unit, ready for rollover.

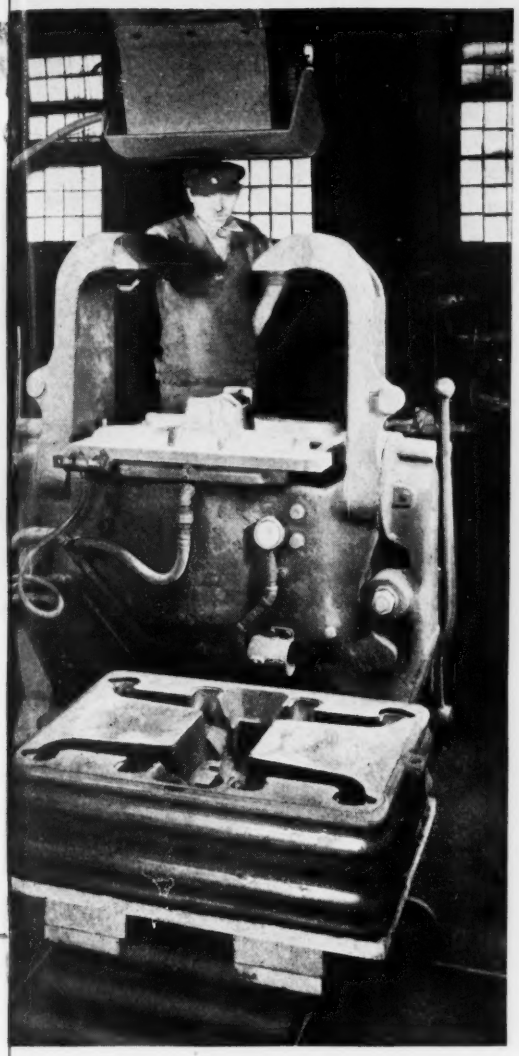


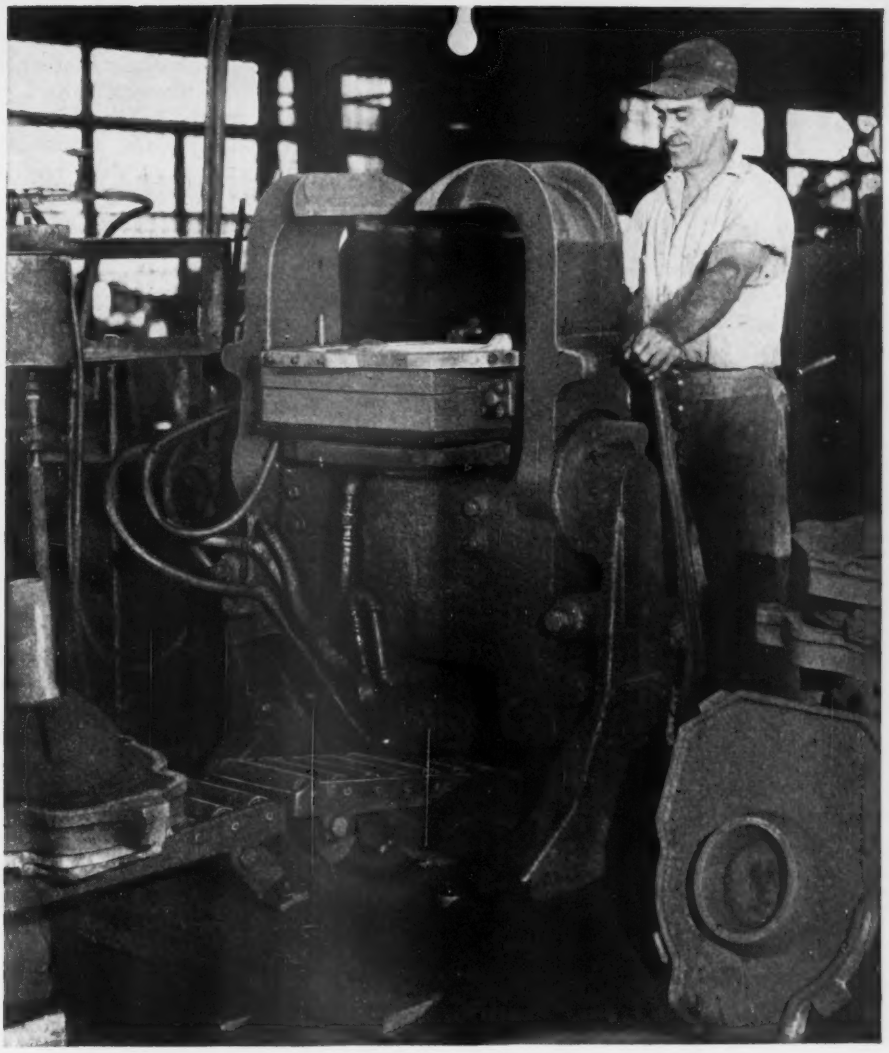
3 ROLLOVER POSITION . . . a slight pull of rollover frame by hand, rolls the machine over ready to operate the draw.



4 DRAW POSITION . . . by actuation of the vibrator valve and draw valve, the pattern is drawn from the mold. Rollers are then raised and mold pushed out by foot.

INTERNATIONAL





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The fastest type Jolt, Squeeze, Rollover, Draw Machine.

Draw is always true because of integral frame and draw feature.

Completely above floor line . . . no pit necessary.

Engineered for ease of maintenance.

The **Type RES** is designed, as are all machines in the INTERNATIONAL LINE, by experienced foundry engineers who have a practical working knowledge of the problems of the business.

Inquiries should specify maximum outside width and length of the largest flask to be used, including trunnions and handles, allowance required for depth of flask, pattern plate and bottom board and amount of draw required.

MOLDING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

MEN *of Industry*

(*Continued from page* 115)

dent of Dominion Brake Shoe in 1947 and will continue in that capacity and as vice president of the Brake Shoe Division.

♦ ♦ ♦

S. D. Baumer has been appointed vice president of the Equipment Manufacturing Division, Air Reduction, New York. Mr. Baumer joined the technical sales department of the company in 1941 as steel mill specialist, became assistant manager of the department in 1944 and manager in 1948. He was at the Johnstown, Pa., plant, Bethlehem Steel Co., prior to joining Air Reduction.

♦ ♦ ♦

Palmer E. Hanson has been appointed sales field engineer for the Machine Division, Osborn Mfg. Co., Cleveland, in northern Indiana, northern Illinois, Iowa, Wisconsin and Minnesota with headquarters in Milwaukee, succeeding **J. C. Alberts** who has returned to military service. Mr. Hanson, who was formerly plant manager, Federal Malleable Co., West Allis, Wis., was previously associated with Arcade Division of Rockwell Mfg. Co., Freeport, Ill., General Malleable Foundry, Waukesha, Wis., and Milwaukee Foundry Equipment Co., Milwaukee.

♦ ♦ ♦

Frank E. Fisher, for the last seven years sales manager, Hydro-Blast Corp., Chicago, has been appointed assistant chief, Foundry Equipment and Supplies Section, General Industrial Equipment Division, National Production Authority, Washington. Mr. Fisher is a metallurgical engineer who obtained considerable experience in the industrial field with Curtis Mfg. Co., St. Louis, Berry Iron & Steel Co., St. Joseph, Mo., and Green Foundry Co., St. Louis. In 1926 he became foundry advisor for Bethlehem Steel Co., and continued in that capacity for nine years. He then went to Western Foundry Co., Chicago, as metallurgist and later was with Sloss-Sheffield Steel & Iron Co., Birmingham, as foundry engineer.

♦ ♦ ♦

D. Frank O'Connor, chairman of the Metropolitan Chapter of the American Foundrymen's Society for 1951-52, for the past two years has operated O'Connor's Foundry Inc., Hackettstown, N. J. Mr. O'Connor joined the Walworth Co., Boston, in 1912 and during his apprenticeship completed a course in foundry practice in the evening school of Wentworth Institute. He served as superintendent of the Walworth brass foundry and division superintendent of brass production and later in an advisory capacity at the Greensburg, Pa., plant. Following a few years as a foundry consultant he became foundry manager, American Saw Mill Machinery Co., Hackettstown, N. J., and when the company closed in 1949 he leased its foundry. Active in the AFS, Mr. O'Connor has served on various committees of the Nonferrous Division and as a director of the Metropolitan Chapter.

♦ ♦ ♦

Charles H. Weber Jr. has been appointed New England sales engineer, Allied Metal Specialties Inc., Baltimore. Mr. Weber was graduated from Newark Colege of Engineering.

♦ ♦ ♦

Franklin I. Fickett, formerly associated with Fairbanks, Morse & Co., Chicago, has been appointed sales engineer in Indiana, Ohio and Michigan, for Hunt-Spiller Mfg. Corp., Boston. **Winfield S. Axford,** formerly comptroller and assistant to the president, has been elected executive vice president-director, A. S. Campbell Co., Boston, and its subsidiary, Hunt-Spiller Mfg. Corp.

♦ ♦ ♦

Dr. Oswald H. Hecht was recently appointed plant metallurgist, Ajax Metal Division, H. Kramer & Co., Philadelphia. Dr. Hecht was graduated from University of Vienna (Austria) and was associated there with Westinghouse Electric Lamp Factory Metal Smelting works Liesing and Metal & Ore Co. He went to Shanghai, China, in 1938 and with Sino-Chemical Co. established China Centrifugal Casting Co. He was forced to leave the country in 1949 when the Communists occupied the country.

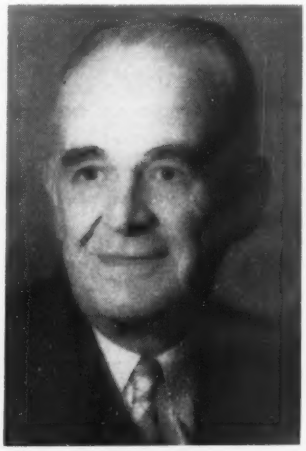
♦ ♦ ♦

Avery C. Newton has been named executive secretary of the Refractories Institute, Pittsburgh. Mr. New-

(*Continued on page* 121)

S. D. BAUMER
. . . vice pres., Air Reduction

PALMER E. HANSON
. . . Osborn Mfg. Co. sales



FRANK E. FISHER
. . . foundry equipment, NPA

D. FRANK O'CONNOR
. . . heads Metropolitan Chapter

Guide Posts ON THE ROAD TO LOWER FOUNDRY Costs

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AQUA-BOND — An emulsified oil that favors low gas and a fast collapsing type of core. An aid to preventing hot cracks in thin walled castings.

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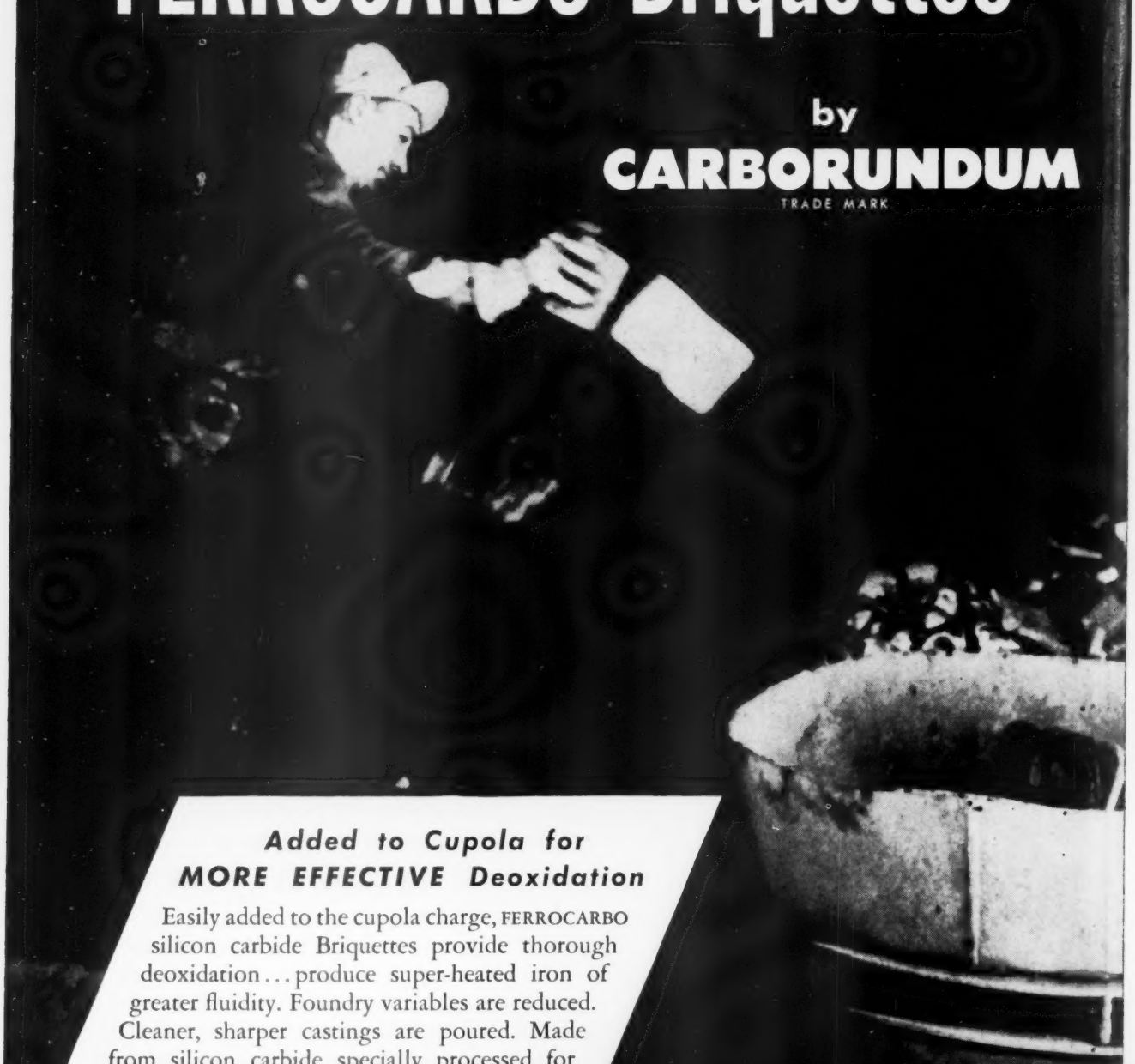

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MEN of Industry

(*Continued from page* 118)

ton for 7 years has been a member of the staff of the American Newspaper Publishers Association, New York. He is a graduate of the College of the City of New York.

♦ ♦ ♦

Charles K. Donoho, chief metallurgist, American Cast Iron Pipe Co., Birmingham, has been elected chairman of Birmingham District Chapter of the American Foundrymen's Society for 1951-52. Mr. Donoho was graduated from Vanderbilt University in 1930 and took his master's degree in chemistry and metallurgy the following year. He joined the company at that time as a chemist and has served successively as metallographer, in the sales engineering department, melting superintendent and plant metallurgist. He became chief metallurgist in 1947. Mr. Donoho is a past chairman of the Birmingham Chapter of the American Society for Metals.

♦ ♦ ♦

James Hallock was recently appointed sales representative, Albion Malleable Iron Co., Albion, Mich. Mr. Hallock was formerly associated with Benton Harbor Malleable Industries, Benton Harbor, Mich.

♦ ♦ ♦

Ralph M. Johnson, vice president in charge of sales, Norton Co., Worcester, Mass., was recently elected president of the American Supply and Machinery Manufacturers Association. Active in the association for 5 years, he has served successively as second and first vice president.

♦ ♦ ♦

Clair Crawford has been named field sales manager of the foundry supply department, Frederic B. Stevens Inc., Detroit. During several years with the company Mr. Crawford has specialized in development and application of foundry facings.

Albert G. Lauzon has been elected president, Buckeye Tools Corp., Dayton, O. **Hal O. Gummere** was named vice president-general manager, **Ervin Reeves,** treasurer and **Earl Hamilton,** secretary. **E. B. Meynard** has become sales manager and **David Thomas,** plant superintendent.

♦ ♦ ♦

Jack B. Weil has been named director of public relations and advertising, Christiansen Corp., Chicago, and its subsidiaries, Alumicast Corp., Chicago, Magnesium Co. of America and Bates Expanded Steel Corp., East Chicago, Ind. Mr. Weil formerly conducted a public relations organization in Chicago under his own name.

♦ ♦ ♦

Clarence B. Bergren, since 1946 service engineer in the St. Louis territory, Independent Pneumatic Tool Co., Aurora, Ill., is the new Cleveland branch manager.

♦ ♦ ♦

J. R. Collins, since 1946 Philadelphia sales representative, has been transferred to the recently opened Chicago sales office, Arcos Corp., Philadelphia, maker of stainless alloy and nonferrous arc welding electrodes.

♦ ♦ ♦

Patrick Dolan, formerly sales engineer, Patterson Foundry & Machine Co., East Liverpool, O., has been named district manager of its newly established Baltimore office at 1605 Court Square Bldg.

♦ ♦ ♦

A. E. Buchanan has been appointed sales representative, Federated Metals Division, American Smelting & Refining Co., New York, to cover North and South Carolina, the eastern half of Georgia and part of Florida. Mr. Buchanan, who has been associated for 13 years with White Brothers Smelting Corp., Philadelphia, will be under jurisdiction of Federated's Baltimore office.

♦ ♦ ♦

Sidney B. Wetherhead, abrasive engineer, has been assigned to the eastern Massachusetts territory, Norton Co., Worcester, Mass. **Charles A. Babbitt** succeeds him in the Maine, New Hampshire and Vermont territory. **Richard D. Burdette** has been appointed abrasive engineer in the North Carolina and Virginia area, territory formerly covered by Mr. Babbitt.

♦ ♦ ♦

Louis C. Begg has been named district manager of the recently established Buffalo sales division, Ampco Metal Inc., Milwaukee. For the past 3 years Mr. Begg has been sales engineer for centrifugal pumps and alloys and other company products in Milwaukee.

♦ ♦ ♦

R. A. Gloss has been appointed sales representative of the Wisconsin and Michigan upper peninsula territory, Federated Metals Division, American Smelting & Refining Co., New York, with headquarters in the Milwaukee office.

♦ ♦ ♦

Richard P. Carroll has been put in charge of budget and material control and **J. William Schaeffer** has been named head of the standards section, Hunt-Spiller Mfg. Corp., Boston.

♦ ♦ ♦

Joseph DePari and **John J. Keegan** recently were honored at an informal plant ceremony for completing 35 years of service with Hunt-Spiller

CHARLES K. DONOHO
. . . Birmingham Chapter chairman

JAMES HALLOCK
. . . joins Albion Malleable Iron

RALPH M. JOHNSON
. . . heads mill supply group

CLAIR CRAFWORD
. . . F. B. Stevens Sales

Mfg. Corp., Boston. Mr. DePari, senior service molder with the company, began his foundry career more than 40 years ago as a molder's helper. Mr. Keegan, supervisor of shipping, who started as an office boy, has been in the shipping department since 1921.

♦ ♦ ♦

Richard S. Neufeld has been appointed assistant to the sales manager, U. S. Reduction Co., East Chicago, Ind. Mr. Neufeld joined the company in 1948 following graduation from University of Chicago. **Howard S. Bowen** has succeeded Mr. Neufeld as sales representative with headquarters in Chicago. Mr. Bowen was graduated from Purdue University and was formerly associated with Aluminum Industries Inc., Cincinnati.

♦ ♦ ♦

Frank E. Watts Jr. has been appointed assistant metallurgist, Hunt-Spiller Mfg. Corp., Boston.

♦ ♦ ♦

John T. Edelen has been appointed sales engineer in the Cincinnati office of the Machinery Division, Dravo Corp., Pittsburgh, assigned to the Kentucky area including Louisville, and part of southern Ohio. Mr. Edelen will also represent De Laval Steam Turbine Co., New York, C. H. Wheeler Division of Hamilton Thomas Co., Hamilton, O., and Walker Process Equipment Inc.

♦ ♦ ♦

Joseph J. Schmelzer, secretary, Arkansas Foundry Co., Little Rock, Ark., has been appointed state chairman of the Arkansas Steel Scrap Mobilization Committee.

♦ ♦ ♦

L. M. Evans has been named to head the new Rochester, N. Y., branch office at 1246 Sibley Tower Bldg., recently opened by Worthington Pump & Machinery Corp., Harrison, N. J. Mr. Evans joined the company in 1936 following graduation from Cooper Union Institute of Technology and has served in the St. Louis, Buffalo and Syracuse, N. Y., offices.

♦ ♦ ♦

Malcolm Wilson, engineer,, Centre Foundry & Machine Co. Wheeling West Va., was recently elected president of the Exchange Club there.

♦ ♦ ♦

Frank E. Wartgow has joined the foundry engineering department, Aircraft Engine Division, Ford Motor Co., Chicago, as process engineer. For some time he has been production manager, Howard Foundry Co., Chicago, and prior to that had been associated with the American Foundrymen's Society and American Steel Foundries, Chicago.

♦ ♦ ♦

J. A. Rumpsa has been appointed general manager, Ordill Foundry & Mfg. Co., Murphysboro, Ill., maker of machinery castings, succeeding **A. Schnipper,** who has returned to Excelsior Foundry Co., Belleville, Ill. Mr. Rumpsa was formerly associated with Caterpillar Tractor Co., Peoria, Ill.

♦ ♦ ♦

Charles Fruchtman recently was present at dedication exercises for Charles Fruchtman Hall which he donated as a men's dormitory for Brandeis University, Waltham, Mass. Mr. Fruchtman is president of Donovan Wire & Iron Co. and its subsidiary, Maumee Malleable Castings Co., Toledo. He is also president of Gendron Wheel Co. and chairman of the executive committee of Peters Stamping Co., both of Perrysburg, O.

♦ ♦ ♦

Arthur B. Morse has been named district manager of the Northern California office Mexico Refractories Co., Mexico, Mo., with headquarters at 2040 Fourth St., Berkeley Calif. For several years Mr. Morse has been engaged in sales and installation of refractory materials in the western states.

♦ ♦ ♦

Edward D. Williams has been named sales engineer in the Philadelphia district office, Chain Belt Co., Milwaukee. Other district sales engineers recently appointed by the company include **Truman J. Hammel,** Kansas City Mo.; **R. W. DeMott Jr.,** New York; **Kenneth Burch,** Cleveland; **George Robichaud,** Boston.

♦ ♦ ♦

John F. Smith Jr., general manager of sales, Inland Steel Co., Chicago, has been granted a six-months' leave of absence to serve as chairman of the production directive committee and assistant director of the Iron and Steel Division, National Production Authority, Washington.

♦ ♦ ♦

William J. Grede, president, Grede Foundries Inc., Milwaukee, was recently re-elected a vice president of the YMCA's national council.

♦ ♦ ♦

Stevens H. Hammond has been elected chairman of the board, Whiting Corp., Harvey, Ill. **J. A. Handley** will continue as vice president and chief executive officer.

THE COVER: Shown on the front cover and reproduced above are the supervisors of Studebaker Corp.'s modernized foundry at South Bend, Ind. Left to right: G. T. Costas, general foreman, molding, days; L. Smanda, general foreman, pattern shop; P. C. Waldron, foundry costs, rates and methods; J. W. Payleitner, trouble shooter; J. C. Madacey, general foreman, molding; Jim Devoir, general foreman, maintenance and electricity; E. J. Buttens, general foreman, molding, nights; Earl Bradley, general foreman, coreroom, days; J. H. Kauffman, foundry engineer; H. A. Graber, general foreman, mill room; Emery Soos, general foreman, coreroom, nights; R. C. Bopes, general foreman, melting department; W. F. McMacken, night assistant superintendent, and E. G. Schmidt, foundry superintendent. (See article, page 72)

SLY TUMBLING MILLS

THE STANDARD OF STURDINESS

The SLY name on your Tumbling Mills has been the Standard of Sturdiness for many years.

Modern Design Throughout

Anti-Friction Bearings — Direct Motor Drive

Sturdy Construction for

Long Life — Low Maintenance

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Can be Furnished as Follows:

Inside diameters: 24″, 30″, 36″, 42″, and 48″.
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Special Designs for

Stove Plate	Sprue Cleaning
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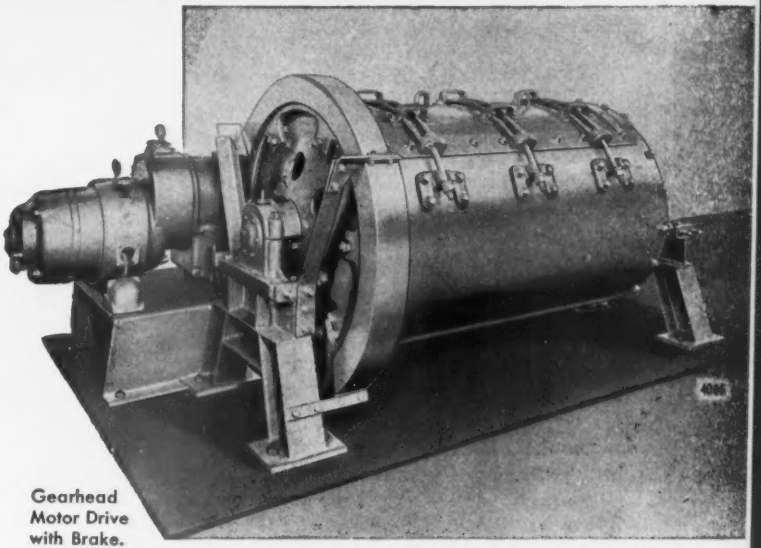
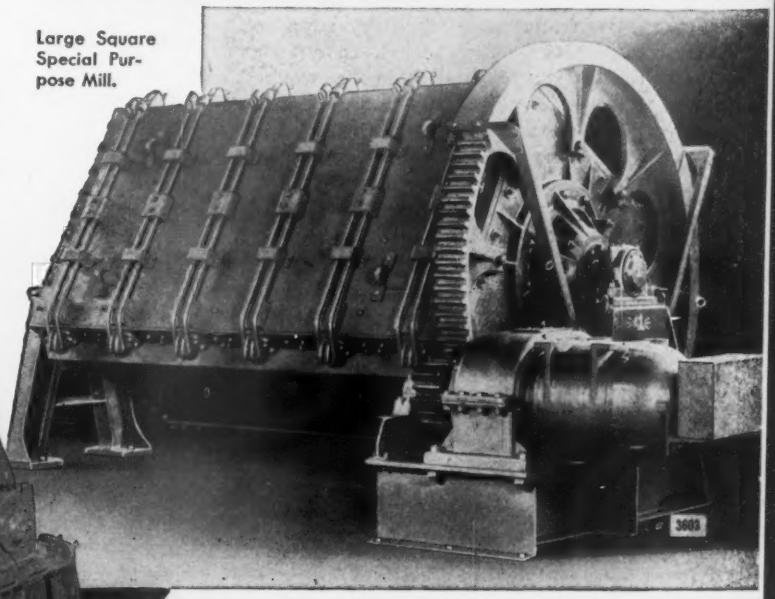
Drives for Mills

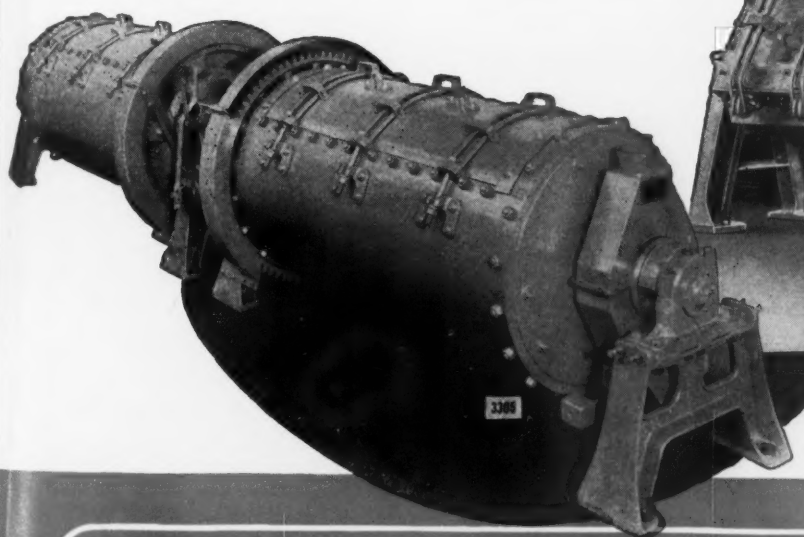
For greatest flexibility we recommend individual direct motor drive, but mills can also be furnished with V-belt drive, or tight and loose pulley for flat belt drive.



Gearhead Motor Drive with Brake.



Large Square Special Purpose Mill.



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AROUND THE COUNTRY

News Reports from . . .

MANY foundries in this area have scheduled their annual vacation shutdowns during July and August. This practice, initiated several years ago, gains new followers as time goes on because, in the long run, production schedules suffer least. Furthermore, equipment can be checked over and repaired to best advantage when the maintenance crew can work without interruption.

Despite the lower melting rate brought about by vacations, there is no lessening in demand for pig iron and other critical materials. Foundries arrange for accepting shipments of iron allotted to them by suppliers during the down period. Inventories thus acquired will soon be worked down when production resumes. Coke is comparatively free at the moment. Production is at a good rate, but requirements of automotive foundries have dropped because of the limitation of automobile production.

Jobbing foundries report it is a toss-up between labor supply and materials as to which is the bottleneck. The two are in reasonable balance currently. If more iron were available, more workers would be needed.

More defense orders for castings are being received but as yet the volume is not heavy.

Aircraft Engine Division of Ford Motor Co., Chicago, has been making test runs on magnesium castings. As patterns are received, castings are made to check molding, melting and pouring procedure to determine the best practice for volume output of Pratt & Whitney Wasp Major engines later this year. Incidentally, the Aircraft Division has produced the plant's first engine cylinder barrel—a more or less hand-built job to test production methods.

On June 7, members of the Chicago Foundrymen's Association conducted their third annual Ladies Night dinner party. This event, held at the Swedish Engineers Society, was attended by about 125 people.

Chicago Chapter, AFS, will conduct its annual Stag Outing and Golf at Lincolnshire Country Club, Crete, Ill., Aug. 4. In addition to golf, the program provides a weight guessing contest, swimming, horseback riding, horseshoes, and a fried chicken dinner followed by a floor show. Prizes and awards will total $1000. Harry E. Cullen, 3426 E. 89th St., Chicago, is outing secretary.

WHILE steel, malleable and nonferrous foundries have sufficient rated business to occupy their full capacity, gray iron shops generally have only a modest percentage of defense and defense-support work on hand. Some have less than 20 per cent. However, the trend toward more rated tonnage is increasing, especially for those engaged in machinery work.

Seasonal influences have cut into overall production. Various foundries were down one or two weeks the first half of July for vacations. Others still have such suspensions ahead of them. For this reason August is expected also to be a rather slow month. However, most foundries, when operating, are going at a good clip. Five days a week is about the minimum and in some cases six days are scheduled, although mostly in the coreroom. Skilled manpower constitutes the toughest problem, even surpassing difficulty in obtaining metallics.

Most foundries in the New York metropolitan area have been operating five or six days a week, although overall schedules have been reduced due to suspensions for vacations. These suspensions are expected to be a factor throughout August. Nonferrous foundries are operating actively on rated work, and the volume of this business is now beginning to increase among gray iron foundries, especially those who have work for the machine tool industry which only recently received a special rating. Backlogs at the iron shops range around seven to eight weeks, with few exceptions.

Stringency in pig iron is pronounced, foundries having to draw heavily on scrap and ferralloys to sustain production. The one cheering note recently has been an easing in the supply of cast scrap, but how long this will last remains to be seen. Common labor is still plentiful, but not so with skilled help. The latter is a very serious problem with all shops.

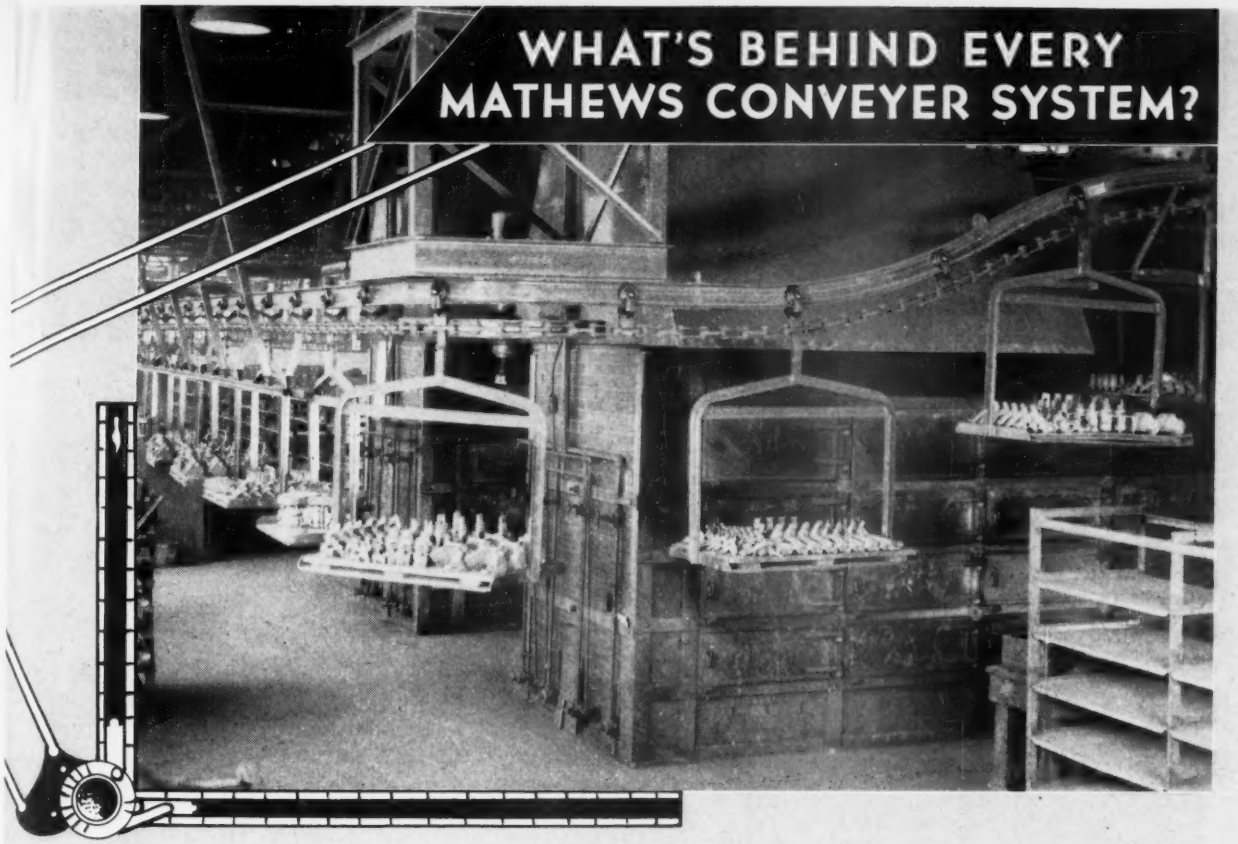
A sign of the times is the fact that one industrial importer here is soliciting business in castings produced by German foundries. Gray iron, steel, brass, aluminum and magnesium castings are offered. Delivered prices are said to be competitive with those of domestic foundries.

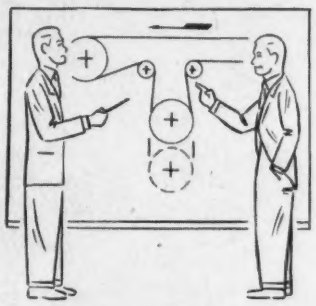
WITH more casting users converted to defense work, some foundries have increased their rated orders by 50 per cent the last 60 days. DO backlogs of steel foundries range up to 70 per cent of total business. Best guess of nonferrous founders is that their rated orders, now edging past 50 per cent, will level off at 60 per cent of the total. Expanding defense backlogs have moved back deliveries of civilian castings to 12 weeks.

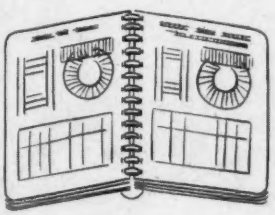
Los Angeles Area Scrap Mobilization Committee has been formed to promote the flow of scrap from district industrial, mining agricultural, and transportation sources. Little foundry scrap is available from dealers. Mill competition for available

(*Concluded on page* 128)

WHAT'S BEHIND EVERY MATHEWS CONVEYER SYSTEM?







SOUND ENGINEERING PRACTICE

● The conveyer system which does the best possible job is the system that was specifically designed to meet the requirements of that job. There is quite a lot of know-how in designing and fabricating conveying equipment, and no place for trial and error methods. It just costs too much to learn the hard way—by actual application—that equipment is too light, poorly constructed, or just improperly designed to do the work.

Mathews Conveyer Systems are made up of Power and Gravity Conveyers and special conveying machinery that is built on sound engineering principles—equipment that is designed to do a specific job well. That's why, when you are buying conveyers, whatever the application might be, you can be sure about this: **If it's Mathews equipment, it has to be right.**

Engineering offices or sales agencies are located in principal cities in the United States and Canada.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

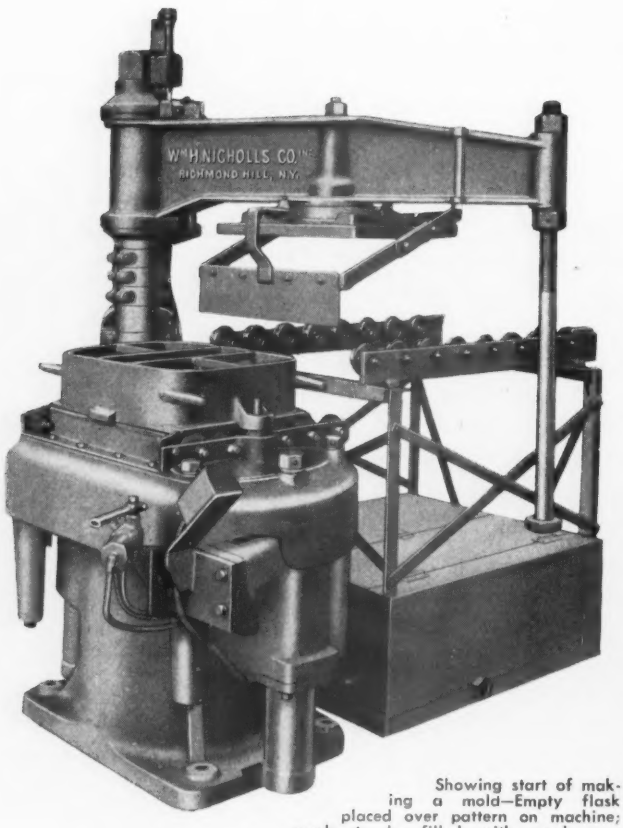
MCC

MATHEWS CONVEYERS

GENERAL OFFICES *Mathews Conveyer Company . . . . Ellwood City, Pennsylvania*
PACIFIC COAST DIVISION *Mathews Conveyer Company West Coast . . San Carlos, California*
CANADIAN DIVISION *Mathews Conveyer Company, Ltd. . . . . Port Hope, Ontario*

HEAVY DUTY MOLDING and PATTERN DRAW.... [redacted] *for fully automatic*

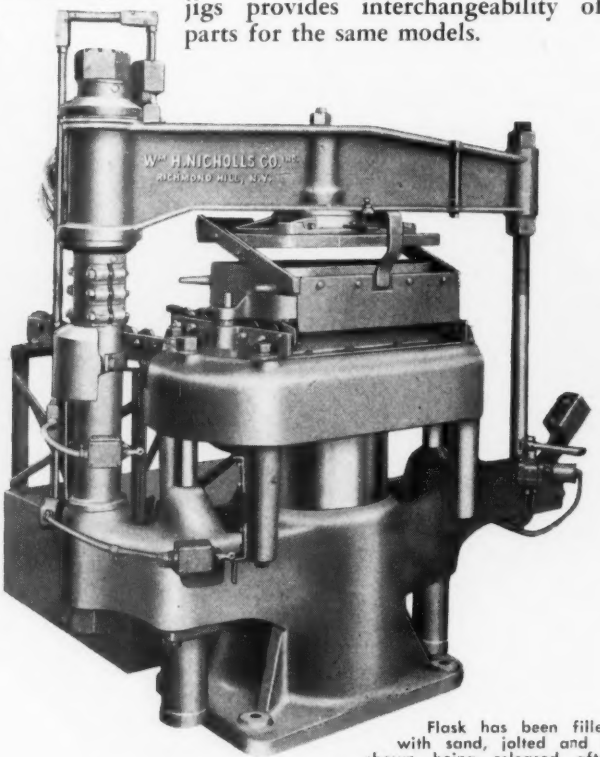
HEAVY DUTY Combination Jolt and Power Squeezer Molding Machines with pneumatic pattern draw and power operated self positioning parallel squeeze head, equipped with electrical controls for single push button automatic operation of jolt, squeeze, pattern draw and cross arm, including automatic sand strike-off, mold pusher and adjustable flask roll-off device.



Showing start of making a mold—Empty flask placed over pattern on machine; ready to be filled with sand.

PRECISION BUILT Pistons and cylinders are finished ground to micrometer sizes. This operation also closes the pores and obviates any danger of rapid wear from dust films present in outmoded smooth turning.

All draw pins and guide bushings are case hardened and ground to precision tolerances for perfect fit and smooth operation. An accurate system of gages and jigs provides interchangeability of parts for the same models.



Flask has been filled with sand, jolted and is shown being released after the squeezing operation in preparation for the pattern draw.

LOW UPKEEP The low upkeep records of hundreds of foundries attest the foresight of Nicholls' Engineers in designing inbuilt features that make for long life and accurate, dependable performance after years of service. As an instance, we point to the dirt-proof housings and forced lubrication that are provided for all critical parts that might otherwise wear quickly and affect permanent alignment and satisfactory operation.

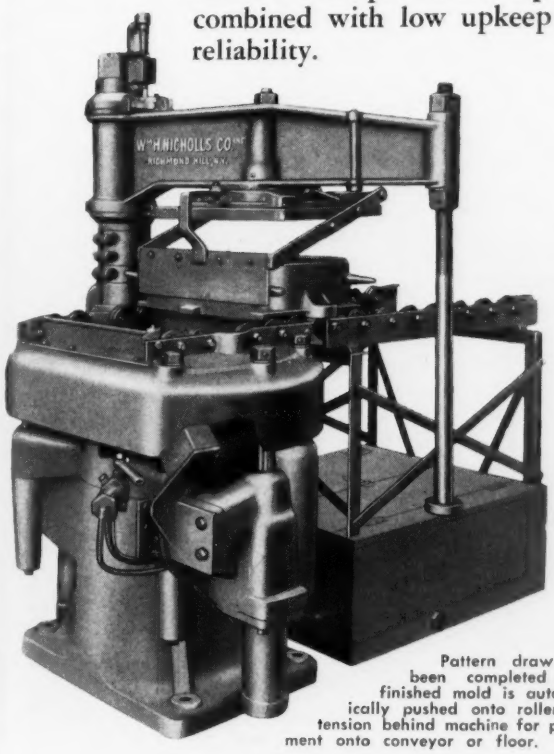
SENSITIVE OPERATION The use of skilled mechanics aided by an accurate system of gages and jigs, assure precision machining and grinding of parts to proper tolerances. Hence the machines are sensitive to the slightest touch of the controls.

MACHINES...JOLT, SQUEEZE

Equipped with Single Push Button operation ★ Adaptable to all sizes of machines

10 SECONDS
—Complete cycle for making a mold—with 4 jolt strokes

The international acceptance of large numbers of Nicholls molding machines for many years is evidence of their productive capacity, combined with low upkeep and reliability.



Pattern draw has been completed and finished mold is automatically pushed onto roller extension behind machine for placement onto conveyor or floor.

GUARANTEED WORKMANSHIP

Smooth, sensitive operation is built into all moving parts of Nicholls' Molding Machines by expert mechanics skilled in their specialized tasks. Close tolerances are made possible by a system of accurate jigs and fixtures.

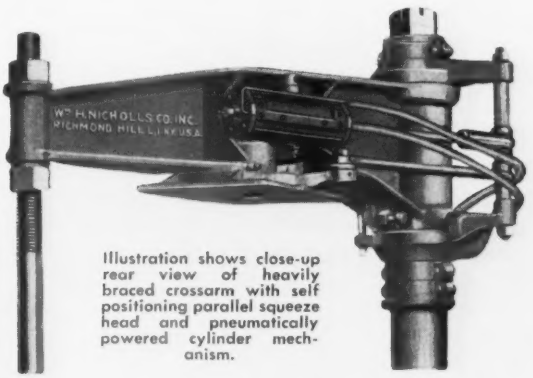


Illustration shows close-up rear view of heavily braced crossarm with self positioning parallel squeeze head and pneumatically powered cylinder mechanism.

MODERN MATERIALS The materials selected for components are alloys best suited for each part, and the decisions have been based on research and the advice of metallurgists. High tensile and transverse strengths provide ample factors of safety at critical points to offset stresses subject to jolting and squeezing.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL, LONG ISLAND, NEW YORK

Foreign Manufacturers and Selling Agents—
For Continental Europe and Great Britain — The George Fischer Steel and Iron Works, Schaffhausen, Switzerland.

NICHOLLS

(*Concluded from page* 124)

scrap, coupled with 20 per cent lower scrap deliveries to dealer yards has reduced some dealers' operations to 15 per cent of capacity. Other factors contributing to the foundry scrap shortage, say foundrymen, are too small price margins on electric furnace and foundry grades, mills' loose definition of what constitutes No. 1 heavy melting, and mill practices of recovering scrap generated by their customers. Some dealers' yard stocks are down to one-day supply.

Aluminum is still plentiful but foundrymen wonder if price rollbacks scheduled by Aug. 1 will make aluminum supplies as scarce as copper. Nonferrous foundrymen say that since June 26 price rollbacks, dealers are withholding scrap copper from the market. While raw material supplies are undeniably tight for most foundries— critical for some — industry observers say shortages are not holding down melting rates more than are production restrictions and scarcity of skilled help.

NPA order M-47A came just in time to give new life to several district nonferrous foundries preparing to shut down. The order benefits foundries not yet in defense production by relaxing prohibitions on non-operational use of copper and aluminum and allows use of copper in previously prohibited ways.

Detroit

SHELL MOLDING was included in a list of eight outstanding new metalworking processes with Ordnance applications, compiled by Gen. Merle H. Davis, chief of Ammunition Branch, Industrial Division, Ordnance, and described by him at a recent meeting of the local chapter of the American Society of Tool Engineers. General Davis was less specific about this process than with any of the others. He made no mention of what Ordnance items are being produced with it, where it may have further military application, etc. He cited it only as an important material and machining saver.

One place where it may come into prominence in production of Ordnance items is among automotive foundries. From all indications, these are the farthest along and most successful with the process. At one Michigan foundry tests are under way aimed at proving to the military the effectiveness of the process in producing certain machine gun parts, now specified as forgings. Machining operations are reduced from over one hundred when the part is forged to about ten when it is shell molded. The finished part, which weighs approximately 4 pounds, can be cast with only a pound or so excess weight, while from the forged product about 21 pounds of metal must be removed.

Tests of the ability of the foundry product to stand up as well as forged parts will have to be conclusive, however. Some segments of the military services have again shown their preference for forgings in applications which were cast during World War II. Foundrymen concede they have to repeat the selling job they did in the last conflict before Pentagon people become fully cognizant of the performance possibilities of castings.

Ordnance, meanwhile, is working to minimize destructive testing of large cast steel sections of armor, a process they readily admit is wasteful of scarce material. They will rely more heavily on Charpy impact tests and aim at eventual elimination of ballistics tests on production castings.

Defense production continues to account for a very small percentage of total foundry production. A random sampling of shops in this area reveals that not more than 10 per cent of current production is connected with the defense effort. The foremost question in most large-scale foundry operators' minds is: "How can we maintain output at economical levels?" For some this means "How can we get enough materials?," for others enough business, and for a small number, enough manpower.

Bulk of foundries queried were more worried about the business aspect than the other lacks. Automobile production is sagging, and nothing is available to take its place. Some "conversion" business has been offered, (this being one foundryman's term for weldments and other formed products which are not normally cast) but lacking permanence, this type of demand is not encouraged. Goal of some shops is to line up enough business to occupy them for a steady five-day workweek. Many believe the six-day operations they sustained for more than a year are out until next year when defense will play a more significant part. For foundries supplying machine tool builders the problems are almost exclusively one dealing with manpower and materials.

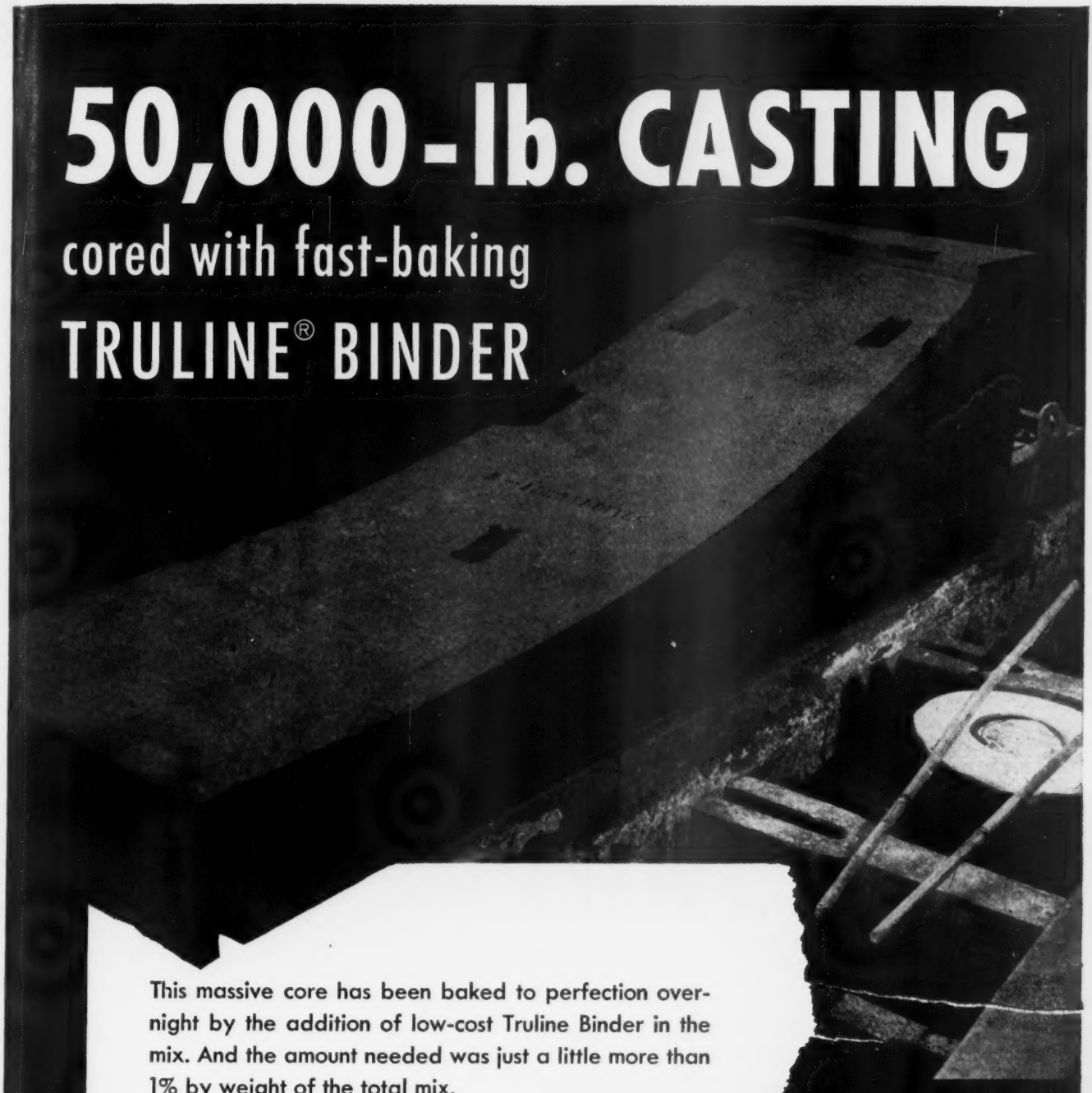
BRITISH VISITOR: Charles Richard Lyons (second from left), market research executive, Imperial Smelting Corp., London, discusses gating on an aluminum permanent mold casting with Walter Bonsack (left), director of research, Alumicast Corp., Chicago, and John G. Mezoff (third from left), vice president and general manager, Alumicast. Mr. Lyons headed a team of 17 members of the British zinc and aluminum die casting industry which recently toured American plants under the auspices of the Anglo-American Council on Productivity and the Economic Cooperation Administration

Describes Gun Factory

Public Information Office, U. S. Naval Gun Factory, Washington, D. C., has published a book entitled *Ordnance Production*, describing the various departments and production facilities of the plant. A section is devoted to a discussion of the foundry, steel and brass, and to the patternshop.

50,000-lb. CASTING

cored with fast-baking TRULINE® BINDER



This massive core has been baked to perfection overnight by the addition of low-cost Truline Binder in the mix. And the amount needed was just a little more than 1% by weight of the total mix.

Used in casting a 50,000-lb. butterfly valve for a large power dam, this Truline-bonded core is typical of the faster, more uniform baking possible in producing large or chunky cores.

Truline Binder also means easier collapsing cores, and up to 50% less cleaning time. And castings come out sounder, truer, cleaner. Write to Hercules for technical data and a generous testing sample.

NF51-4

TYPICAL CORE MIX

2,000 lbs. Sand 53 A.F.A.

400 lbs. Silica Flour

100 lbs. Fire Clay

50 lbs. Bentonite

30 lbs. Truline

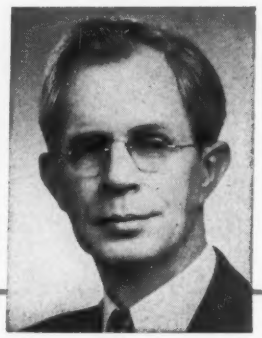
7-8% Moisture

HERCULES POWDER COMPANY INCORPORATED Naval Stores Dept., 920 King St., Wilmington, Del.

MAN-TO-MAN

on the Molder's Bench

"Professional Leadership"



By RALPH L. LEE

I KNOW a certain foundry superintendent who is almost as keen about patternmaking as I am. The boys tell me that, whenever he can't be found on his supervisory rounds out in the shop, the chances are ten to one he'll turn up over in the pattern shop rigging up some job while the patternmaker stands by waiting to hand him things. I happen to know that this particular patternmaker could handle the very same job without nearly so much fuss and with considerably more of the old professional touch.

But this superintendent likes to use his hands along with his head. He'll instinctively drop any of his supervisory chores to push a molder away from his bench to get elbow deep into some molding problem. Since trouble is his meat he sees a whole lot more of his boys who are having lots of trouble than he does of those who go clicking along day after day without a hitch. I expect there are times when the old standbys who keep on hitting the ball while they turn out rent-paying items week in and week out feel pretty much like orphans.

All of which brings up a problem as old as the foundry business itself —that of trying to find individuals who have in them what it takes to develop into combination master molders, metallurgists, engineers, accountants, leaders and business managers for filling the jobs of foremen, superintendents and managers.

One time way back, when I was taking over a little church for a while down in southern Ohio, Bishop Reese (God rest his soul), one of the wisest and most effective leader-managers I have ever known, said, "Ralph! I have learned from many years of experience that it is next to impossible to find a minister who is an outstanding preacher, an effective pastor and a capable organizer and manager all wrapped up in one package. Some of the finest pastors I have known," he went on, "were only passable preachers and the best preachers couldn't pastor very well, although I will say that the best managers who didn't shine in either of these categories managed to get help that did shine."

But in spite of this, we all know that churches and foundries manage to carry on with square and oval pegs in round holes. There are certainly plenty examples of natural-born craftsmen who, against their instinctive urge to work alone, are caught in the web of circumstance and forced to struggle on with butterflies and ulcers down in their tummies at supervisory and management jobs others could handle with one hand tied behind them.

One of the best friends I ever had was selected in a pinch to become chief engineer of a young and struggling concern which later struck oil and blossomed out into the big-time class. No man could have tried any harder than he, but he knew down inside that his abilities were unsuited to the job, and everyone else who came in contact with him either knew or suspected it. But due to misplaced loyalty on the part of those who picked him out, or the fear of facing the music of their obvious mistake, they let that poor fellow practically wreck his health and then were forced to cut him loose.

This thing of handing out supervisory jobs as though they were prizes for solo work well done has got us into one whale of a lot of trouble, and those who suffer the most are the unfortunate and unqualified ones who were supposed to be honored. I know from actual experience as a worker, foreman and manager that it's a darned sight easier to supply the natural-born leader with the technical help he needs to make an outstanding success of his job than it is to supply the leadership qualities a natural-born craftsman lacks, to do even a mediocre job of management or supervision.

In fact, I have concluded that supervising or directing others is a separate and distinct profession, and that success in this profession requires a specific type and kind of talent to start with, a specific type and kind of education regardless of the technical differences in the work being supervised. After seeing ex-bankers, accountants, sales managers and educators who didn't know a cope from a drag put a failing foundry back on its feet with the help of master craftsmen, I just know that the time is here for us to recognize the wide difference between craftsmanship and supervisory ability.

Mulling this situation over it struck me that a recognition of these hard facts might help us sharpen our sights as to what we really want to accomplish through the splendid Foundry Educational Foundation.

If the real nubbin of our hope and dream is that in some way or other a good crop of super-duper foremen, superintendents and managers—plus a proportionate number of engineers and technologists—will finally shake out of the groups of young men we are helping to support while they go to school, we had better be sure that the studies they are taking are tailored to those ends.

If what we are really after is to raise the general knowledge level of future foundrymen for all departments of the industry in the hope that those with talent for supervision, engineering or craftsmanship will finally fall into their respective niches, then I would say that broad general courses leaning toward the foundry would fill the bill. However, if these courses get to be too general, we might find that the standard courses now furnished by our universities all over the country might be all right as they are, without guidance or help from the industry.

I personally have felt for a long time and have hinted in my writings that we need a special and exclusive breed of foundry engineers very badly, even in our smaller foundries. This

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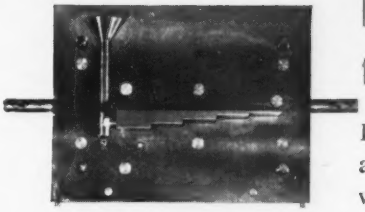
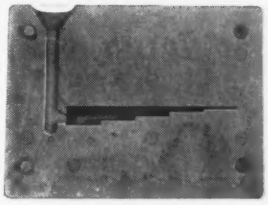
Research Looks For Results



Test pattern



Mold made by shell molding

Monsanto research develops better resins... for better results with shell molding

Here—in the Monsanto Research Laboratories—technicians are shown conducting physical tests on "shell" molds made with Resinox phenolic resins. Typical of dozens of exhaustive tests in Monsanto's continuous research program to develop special Resinox resins with the *best* properties for the new shell molding process.

Here, too, Resinox resin binder-sand mixes are measured in their ability to form to patterns quickly . . . to set permanently with close dimensional accuracy. Other tests insure that the intricate detail of the pattern is matched in the thin wall sections of the mold. And above all, the finished molds are evaluated on the basis of the castings they produce:

1. Castings with superior finish.
2. Castings with dimensional accuracy comparable to precision casting techniques.
3. Castings requiring little or no cleanup.

Monsanto's year-round research continues to work on the development of improved resins for foundry use. For current data on research-built Resinox phenolic resins for shell molding and core bonding, use the coupon below. Resinox: Reg. U. S. Pat. Off.

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MONSANTO CHEMICAL COMPANY,
Plastics Division, Room 5704 Springfield 2, Mass.

☐ Please send me your booklet, "The 'C' Process for Making Molds and Cores for Foundry Use."

☐ Please send me information on Resinox for _____

Name & Title _____

Company _____

Address _____

City, Zone, State _____

(*Concluded from page* 130)

means engineers in every sense of the word who have chosen foundry engineering as their lifetime profession, in which they have determined to make a name for themselves and with no interest whatever in becoming foremen, superintendents or managers.

Everyone I talk to speaks of a widespread and pressing need to have all engineering students—whether electrical, mechanical, aeronautical, chemical or civil—become inoculated with the principles and practices of the cast metals processes so they can get their heads screwed on straight as to the limitations, advantages and demands of this noble craft. This certainly falls within our educational bailiwick, because the engineering student is the foundry's potential customer of the future.

Then, as we all know, we need supervisors who are qualified with both natural talent and special education to tackle the tough problems of this new and different age. But from what I have tried to find out (and I certainly *have* tried) we have not looked upon supervision as a profession requiring its own peculiar type of education, nor have we tried to work out some procedure for locating qualified talent and processing this talent through the specialized schooling and training it will take to fill the bill. Even so I haven't the slightest doubt that folks who can lick the kind of problems we have in the foundry business can lick this one.

Unless we decide specifically what we are after, I don't think we will be able for long to interest young men in investing four years of their lives even on our money solely on the basis that the foundry industry offers splendid opportunities for young men with a good technical education who are willing to work hard and long to reap a just reward for their efforts.

The theological student decides to go to college instead of going to work on the basis of a picture he sees of himself as minister of a church. The medical student plows through his years of book drudgery inspired by a picture of him seated in his office with his shingle out in front. The law student keeps his spirits up with a picture of his name in gold letters on his office door.

We've got to help foundry students picture some spot in a foundry with themselves in the middle of that spot. Whether it be as foundry engineers, metallurgists, researchers, foremen, superintendents or managers, it seems to me that we can hardly help them picture spots worthy of all the schooling they will have to take if we ourselves do not know what these spots are.

Book Review

Symposium on Rapid Methods for the Identification of Metals, paper, 78 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $1.75.

Covering the most recent developments in the field of rapid methods for identification, the book contains some not previously described. It contains nine papers dealing with "Development Present State and Outlook of Spot Test Analysis"; "Electro Spot Testing and Electrography"; "Instruments for Rapid Metal Identification"; "Separating Alloys by Relative Spot Tests"; "Rapid Methods for Identification of Copper-base Alloys"; "Rapid Identification of metal Finishes"; "Examination of Plated and Protective Coatings by Electrographic Analysis"; "Field Test Kit and Procedure for Use in Rapid Identification of Some Nickel Alloys and Stainless Steels" and "Rapid Tests for Identifying Alloy Steels".

Meetings of Interest to Foundrymen

Sept. 10-14—International Foundry Congress, Brussels, Belgium

Sept. 10-14—Instrument Society of America, conference and exhibit, Sam Houston Coliseum, Houston, Tex.

Sept. 21—Malleable Founders Society, industry meeting, Hotel Cleveland, Cleveland

Sept. 24-25—Steel Founders' Society of America, fall meeting, The Homestead, Hot Springs, Va.

Oct. 5-6—Northwest Regional Foundry Conference, Washington, British Columbia, Oregon, and Oregon state student chapters, AFS, Vancouver, B. C., Canada

Oct. 8-12—National Safety Council, congress and exposition, Chicago

Oct. 11-12—Michigan Regional Foundry Conference, Michigan State College, East Lansing, Mich., sponsored by Michigan chapters, AFS, and the college.

Oct. 15-19—American Society for Metals, annual meeting and exhibit, Michigan State Fair Grounds, Detroit

Oct. 19-20—New England Foundry Conference, MIT, Cambridge, Mass.

Oct. 19-20—Texas Regional Foundry Conference, Texas Chapter of the AFS, Shamrock Hotel, Houston, Tex.

Oct. 25-26—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Oct. 31-Nov. 2—Foundry Equipment Manufacturers' Association, annual meeting. The Homestead, Hot Springs, Va.

Nov. 1-2—Metals Casting Conference, sponsored by Purdue University with Michiana and Central Indiana AFS chapters, Purdue University, West Lafayette, Ind.

Nov. 7-9—Mechanite Casting Manufacturers, annual meeting, the New Yorker, New York

Nov. 7-9—National Foundry Association, annual meeting, Shoreham Hotel, Washington

Nov. 8-9—Quad City Regional Foundry Conference, Blackhawk Hotel, Davenport, Iowa

Nov. 8-10—Steel Founders' Society of America, Technical and Operating Conference, Carter Hotel, Cleveland

Nov. 15-16—Magnesium Association, annual meeting, Biltmore Hotel, New York

Dec. 6-8—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Hotel William Penn, Pittsburgh

1952

Jan. 17-19—California Regional Foundry Conference, Northern and Southern California Chapters, AFS, San Francisco

Feb. 7-8—Wisconsin Regional Foundry Conference, Wisconsin Chapter, AFS, and University of Wisconsin, Hotel Schroeder, Milwaukee

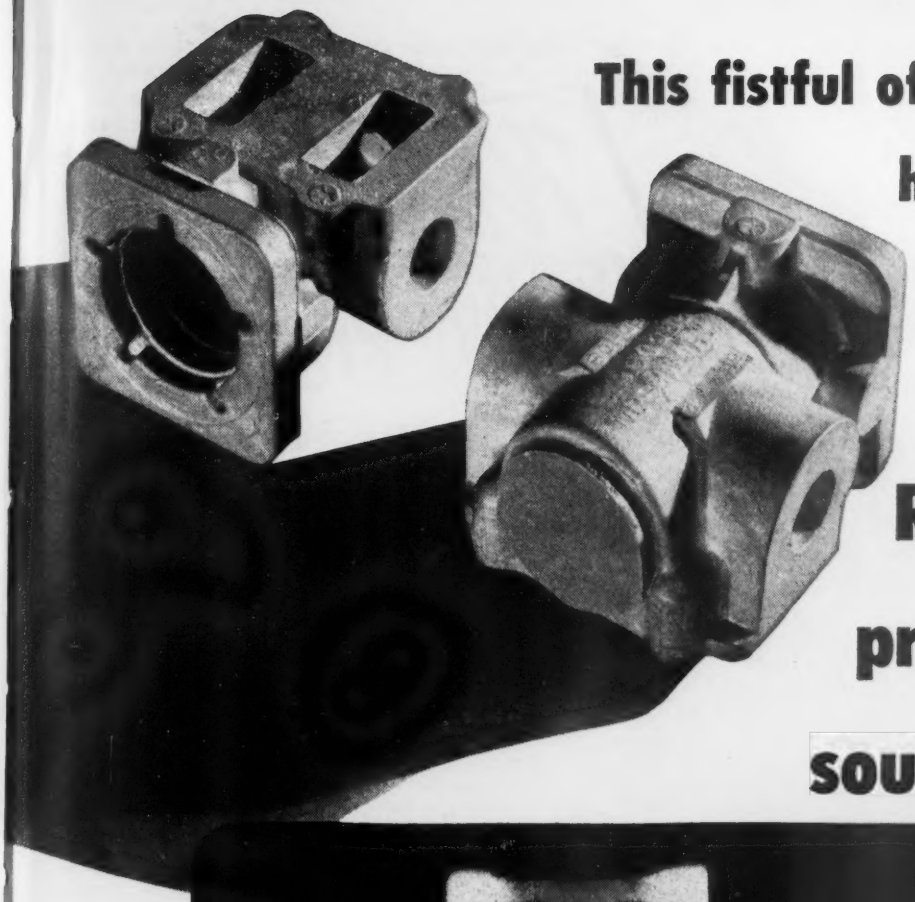
Feb. 21-22—Birmingham Regional Foundry Conference, Birmingham District Chapter and University of Alabama Student Chapter of the AFS, Tutwiler Hotel, Birmingham

Mar. 3-7—American Society for Testing Materials, spring meeting, Statler Hotel, Cleveland

May 1-7—American Foundrymen's Society, annual convention, Atlantic City, N. J.

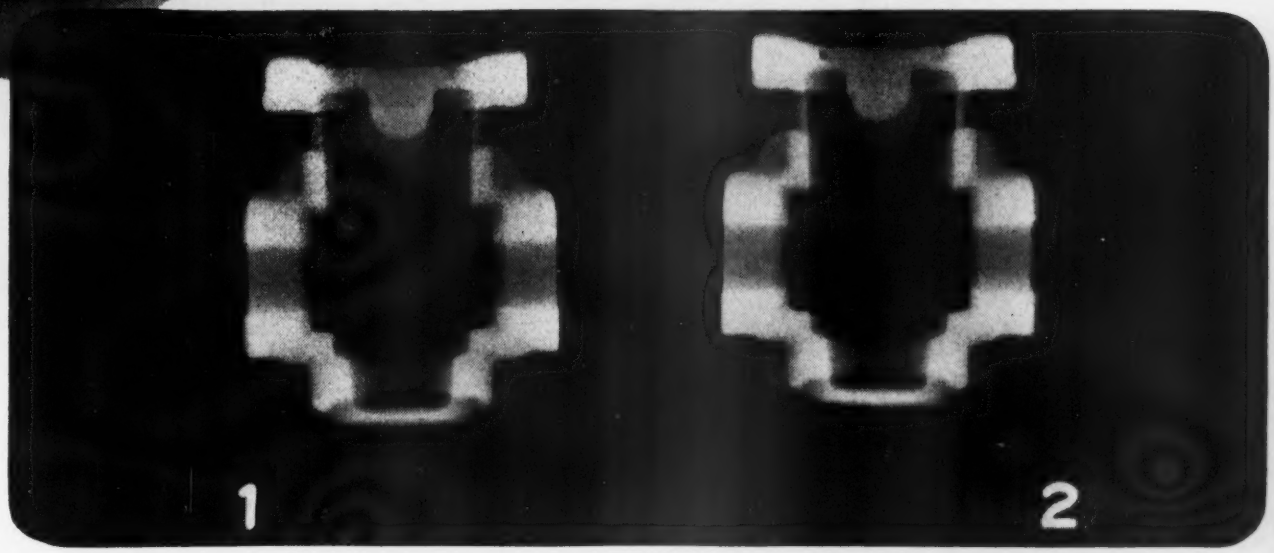
June 23-27—American Society for Testing Materials, annual meeting, Statler Hotel, New York

Oct. 16-17—Gray Iron Founders' Society, annual meeting, Hotel Cleveland, Cleveland



This fistful of pump has a plane-size job...

Radiography proves it sound



PERFORMANCE requirements for airplane parts run high. They must be strong and rugged. Even with light alloys, demand is for less weight.

Here is where radiography plays an important part. For the designer, knowing all castings used will prove sound, can plan to use the minimum of metal and still maintain needed safety margins.

Foundries making large or small castings—of light alloys or heavy metals—find it valuable to radiograph their castings. Then they know only highest quality work is released. Through pilot castings prior to large production runs, radiography frequently indicates ways in which methods can be improved to save time and increase yield.

Your x-ray dealer will gladly discuss how radiography can improve your plant operations. And if you wish, we will send you a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

another important function of photography

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If you have core-making or casting problems that need weeding out, and your analysis shows that your present binder isn't all that it's been cracked up to be, consider a change to Smith L-O.

Here is the *controlled quality* core oil . . . absolute in uniformity because it is Dow-Therm processed.* The record proves Smith L-O to be superior in binding strength; an oil that gives you tough yet flexible cores. With Smith L-O, cores are easily worked, bake rapidly, shake-out cleaner.

For a convincing clincher, try Smith L-O yourself. We're certain you'll be satisfied.

**The only core oil processed by this indirect fire method.*

Smith L-O Core Oil

ROD DIP LIQUID PARTING

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MANUFACTURERS OF L-O AND CERTIFIED CORE OILS

INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

Industry BRIEFS

BAY State Abrasive Products Co., Westboro, Mass., has started a $1,200,000 expansion program. Extension of present factory and storage buildings will take $700,000, the balance to be used to purchase new equipment, including a 280-ft-long, high-temperature tunnel kiln.

* * *

Six manufacturing affiliates of General Electric Co., Schenectady, N.Y., have become departments of the parent company. They are: Carboloy Co., Detroit; General Electric X-Ray Corp., Milwaukee; Locke Inc., Baltimore; Telechron Inc., Ashland, Mass.; Monowatt Inc., Providence, R.I., and Trumbull Electric Mfg. Co., Plainville, Conn.

* * *

Allied Metallurgical Co. has been incorporated at Albany, N. Y., as a general foundry and machine shop. Directors are: Charles J. Scott, Trailor Park Grounds Rd., Colonie, Albany; Jesse F. Wilson, Six Birch Ave., Albany, and George Bedian, 685 Washington Ave., Albany.

* * *

Simonds Abrasive Co., Philadelphia, has moved branch office and warehouse facilities in Chicago and Detroit. The new Chicago warehouse, formerly at 127 South Green St., is now at 3323 West Addison St. In Detroit, the warehouse, formerly at 8829 Hubbell Ave., is now at 17155 Conant.

* * *

Pittsburgh Coke & Chemical Co., Pittsburgh, has awarded Koppers Co. contracts for construction of a new blast furnace at its Pittsburgh Neville Island plant. New furnace will have capacity of 850 tons of pig iron per day.

* * *

Associated Sales & Mfg. Co., Middleville, Mich., has been formed by Fred M. Keller, president, Middleville Engineering & Mfg. Corp., to produce magnesium die-cast products.

* * *

Federal Burner Corp., Los Angeles, a gray iron foundry, is moving from 3307 East Pico Blvd., upon completion of its new plant at the corner of Jefferson and Oak Streets, Torrance, Calif.

* * *

Detecto Scales Inc., 540 Park Ave., Brooklyn 5, N. Y., has purchased the Yale scale business of Philadelphia Division, Yale & Towne Mfg. Co.

* * *

Cleco Division, Reed Roller Bit Co., Houston, Tex., makers of air tools and accessories, has appointed the following distributors: House of Pfaff Inc., 10-36 49th Ave., Long Island City 1, N. Y.; Keystone Builders Supply Co., 85 Palm St., Rochester 13, N. Y.; Pit & Quarry Equipment Co., 3828 East Washington St., Indianapolis, and Hays Supply Co., Memphis, Tenn.

* * *

Ohio Electric Mfg. Co., Cleveland, has acquired an 8-acre site on Dunham Rd., Maple Heights, Cleveland suburb, for erection of a 35,000-sq-ft plant to manufacture lifting magnets, nail making machines, electric hoists, and drilling machines.

* * *

Coles Cranes Inc., Chicago, subsidiary of Steel & Co. Ltd., Sunderland, England, has leased 100,000 sq ft of building area on the Rockdale site of Interlake Industry Corp., where Coles will manufacture its line of mobile cranes.

* * *

Roots-Connersville Blower Corp., Connersville, Ind., is investing $1,500,000 in a construction program involving new erection floor, expansion of present test facilities, manufacturing space and machine tools.

* * *

Keokuk Electro-Metals Co., Keokuk, Iowa, at the request of the Ferroalloys Branch of the National Production Authority, has undertaken a $1,700,000 expansion program. Productive capacity already has been expanded 50 per cent at the Wenatchee Division, Rock Island, Wash., and new equipment and modernized facilities are planned for the Keokuk plant.

* * *

Robinson Clay Product Co., Akron, O., has started an extensive plant expansion program in the Tuscarawas County area including a new tunnel kiln and a new periodic kiln at Parral, O., and a periodic kiln at Midvale, O.

* * *

Industrial Supplies Co., 324 North Seventh St., Steubenville, O., has been named distributor for Allis-Chalmers motors and controls in eight eastern Ohio and four northern West Virginia counties.

* * *

Wheelco Instruments Co. has appointed Engineering Products Co., P.O. Box 1107, Charleston 24, W. Va., district agency for West Virginia State. Office is headed by F. E. Anderson.

* * *

Snow Irrigation Equipment Co., Los Angeles, plans construction of a foundry for manufacturing steel valves at Tempe, Ariz.

* * *

Glauber Brass Inc., Kinsman, O., is constructing a nonferrous foundry at Tyler, Tex., for manufacture of plumbing valves.

CLEAN AIR is an outstanding characteristic of the new office building of American Air Filter Co., Louisville. Three types of company-manufactured filters are installed in series in the air conditioning systems. One of the systems is observable behind plate glass windows adjacent to an exhibition space housing show models of company products. Humidistats located at various points in the building control air moisture content; a thermostat in each office permits individually controlled temperatures

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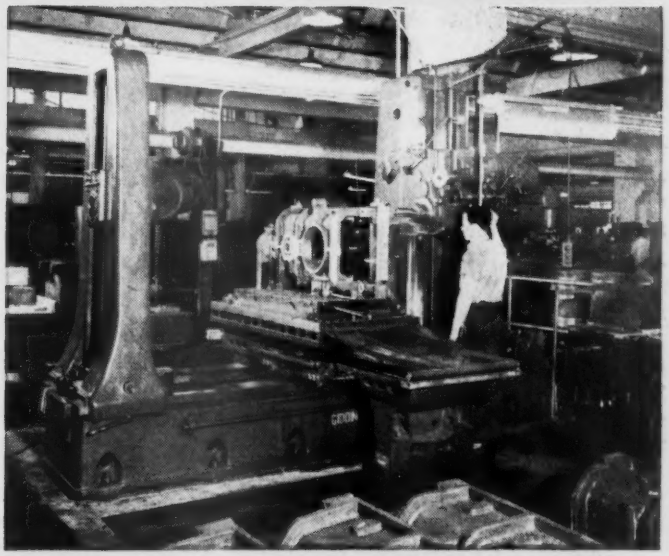
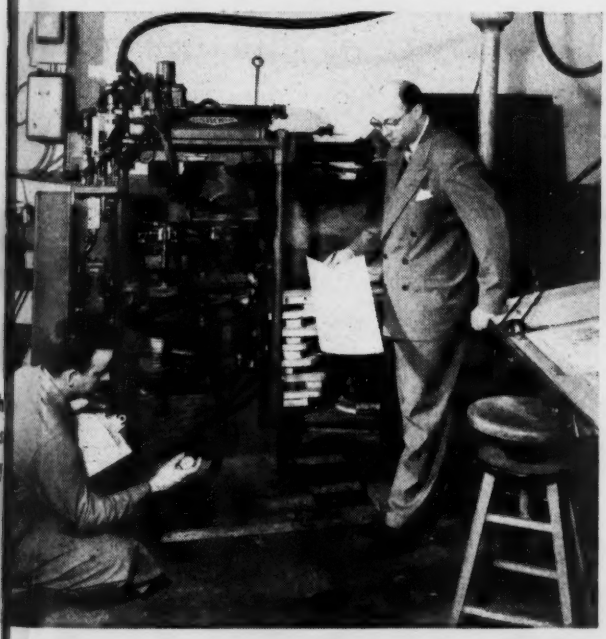


Backed by Modern Manufacturing Plant using precision machine tools and latest production methods.



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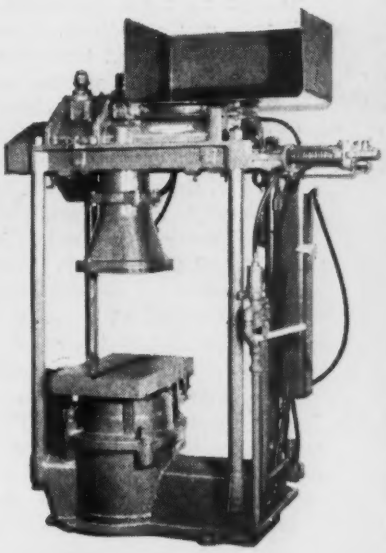

OSBORN

MOULDING MACHINES CORE BLOWING MACHINES

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

By GEORGE K. DREHER
Executive Director
Foundry Educational Foundation
Cleveland

THE FEF
Its Accomplishments and Future Opportunities

STIMULATED by the demands of defense production, the need for technically trained men has resulted in the foundry industry offering approximately three positions for every available engineering graduate who has evinced interest in foundry work as a career. The intense competition for these young engineers has found the castings industry adversely affected by undeveloped recruiting practices.

This situation, however, emphasizes the growing acceptance of these young men by our industry. In turn, this and other factors, have revealed the areas in which the Foundry Educational Foundation must be active in the years ahead.

Most of the foundation's original tasks have been accomplished; briefly they are:

1. Interest by Engineering Colleges—The acceptance of the foundry industry by engineering colleges through the FEF has been a near miracle. The original group of five schools participating in the FEF program has expanded to these fourteen: Case Institute of Technology, University of Cincinnati, Cornell University, Massachusetts Institute of Technology, University of Wisconsin, Northwestern Technological Institute, University of Alabama, Michigan State College, Missouri School of Mines, Ohio State University, Pennsylvania State College, Purdue University, Illinois Institute of Technology, University of Michigan.

In addition, at least six or more universities and their local foundry industry are seeking association.

2. Interest by Students—For the past three years the FEF has annually registered between 400 and 500 students. From this group over 500 graduates have entered our industry and nearly 700 have been given summer jobs. Numerous men who have been recruiting for years on behalf of large firms now report active interest in foundry careers as against no response prior to the FEF.

3. Foundry Courses—The 14 FEF colleges have offered constantly improving series of courses designed to acquaint *all* engineers with the engineering properties of cast metals. In the past four years over 20,000 students have taken these courses. In all, some 70 courses specifically teaching cast metals technology are now active.

The present tasks are coupled with opportunities for further development. The important ones are:

1. Scientific Technology—Many students have been and are studying for advanced degrees using foundry technology for their thesis. This and the activity of the faculties teaching foundry technology are beginning to reveal a vast fund of knowledge in other industries and fields of scientific pursuit which can be related to technical and practical application in producing cast metals.

This trend is fostered through technical meetings of our industry, individual discussions and contacts and the annual conference of the FEF advisory committees. This conference is developing into a forum by which advances in teaching cast metals technology are spread among engineering colleges.

Completion of several fine laboratories and the present construction of others has given impetus to the application of higher science to the foundry industry. These facilities are now complete at Alabama, Cornell, Wisconsin, Michigan State and University of Michigan. A new laboratory is being developed at MIT although an excellent one was in existence, and the same holds true for Missouri School of Mines, Ohio State and Purdue. Plans are under way for new facilities at Case, Northwestern and Penn State.

2. Demand Up; Graduates Fewer—No answer is in immediate prospect. The low birth rate of the early thirties cannot be corrected now and the demands of the military are indeterminate. A partial answer exists within the industry and is covered in the following section. One answer exists

(*Concluded on page* 140)

Graduating Students Entering Foundry and Allied Industries

(1951 group estimated)

Entered Program	School	1947-48 *S	*V	*R	1948-49 S	V	R	1949-50 S	V	R	1950-51 S	V	R	Summary S	V	R	Total
1947	Case Institute of Technology			4	7		1	6	3	5	12		1	25	3	11	39
1947	University of Cincinnati	3		4	2		6	5	5	8	6	4	2	16	9	20	45
1947	Cornell University			4			1		1	2	7	2	1	7	3	8	18
1947	Mass. Inst. of Technology			9	4		7	11	13	8	10	5	5	25	18	29	72
1947	University of Wisconsin	4		10	3		1	14	2	4	14	4		35	6	15	56
1947	Northwestern Tech. Institute				2		3			1	5			7		4	11
1949	University of Alabama									2	7			7		2	9
1950	Michigan State University						6		3	5	7	10	1	7	13	12	32
1950	Missouri School of Mines						1			18	5	5	2	5	5	21	31
1950	Ohio State University						2		11	3	6	3	3	6	14	8	28
1950	Pennsylvania State College						4			1	3	4	2	3	4	7	14
1950	Purdue University						3			4	6	7	6	6	7	13	26
1951	Illinois Inst. of Technology												3			3	3
1951	University of Michigan																
	Miscellaneous Schools			11			15			27			33			86	86
	TOTALS	7		42	18		50	36	38	88	88	44	59	149	82	239	470

* S—Scholarship. V—Voluntary. R—Regular.

Summer Student Workers in the Foundry and Allied Industries

(1951 group estimated)

Entered Program	School	1947-48 *S	*V	*R	1948-49 S	V	R	1949-50 S	V	R	1950-51 S	V	R	Summary S	V	R	Total
1947	Case Institute of Technology	6		2	17		7	18	2	7	6	9	5	47	11	21	79
1947	University of Cincinnati	4			13		2	3	3		5	1		25	4	2	31
1947	Cornell University	8		9	8		3	8	4	5	11	7	9	35	11	26	72
1947	Mass. Inst. of Technology	2		26	4		9	2	4	20	4	8	1	12	12	56	80
1947	University of Wisconsin	1		2	11		7	3	16		10			25	16	9	50
1947	Northwestern Tech. Institute	1			3			5	3	4	8		1	17	3	5	25
1949	University of Alabama						3	11	2	3	7	3		18	5	6	29
1950	Michigan State University						5		1	11	4	8	1	4	9	17	30
1950	Missouri School of Mines						4		1	4	4			4	1	8	13
1950	Ohio State University						9		8	6	2	7	7	2	15	22	39
1950	Pennsylvania State College						3		1	7	5	6	4	3	7	14	24
1950	Purdue University						2			17	4	3	7	4	3	26	33
1951	Illinois Inst. of Technology												3			3	3
1951	University of Michigan																
	Miscellaneous Schools			36			14			40			11			101	101
	TOTALS	22		75	56		68	50	45	124	68	52	49	196	97	316	609

* S—Scholarship. V—Voluntary. R—Regular.

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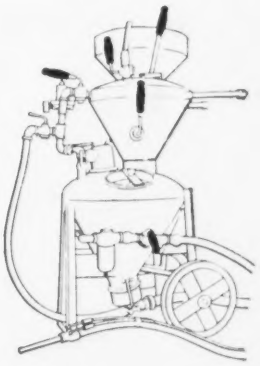

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(*Concluded from page* 138)

in a larger number of schools but the FEF is beyond the practical servicing of even the present 14 without readjustment in staff.

3. **Recruiting and Training**—For many years American business has sent representatives to universities on recruiting missions. Our industry must follow the custom. Personal contact is the most effective way and where foundrymen have used this method, results have been excellent. The aggressive young man sees more opportunity in small companies than in larger ones. The advisory committees of the foundation are proving a big help in this move.

Training these young men for technical, supervisory and managerial positions is another area in which the bulk of the foundry industry requires further development. A training plan is highly desirable and, contrary to popular belief, is just as successful in a small 50 to 100 man plant as in a large organization. One of the most successful plans involves the parallel training of engineering graduates with young men selected from within the organization who have not had the benefit of higher education.

4. **Increased Committee Responsibility**—There has been a slow development of the advisory committee plan within the FEF movement. In the 1950-51 school year this development was given added impetus and the committees were enlarged and more thoroughly organized. As these committees accepted added responsibility the program itself has developed by leaps rather than by steps. Many desirable activities have been initiated by some of these groups, and one of the future tasks of the future years is to spread this work through all 14 FEF schools. It would include such events as recruiting days, meeting with student foundry chapters or other organizations, inviting foundry students to attend chapter or other foundry group meetings, providing models, samples and production equipment for laboratory study, assisting with the procurement of desirable equipment and engineering laboratory layouts where requested. Most important of the committees' functions is in placing summer student workers and even graduates within the area adjacent to the university.

5. **Design and Use Data**—Contact of the FEF with universities continues to emphasize the relative lack of design and use data available in the study of castings vs. other methods of fabrication. While development of such data is not directly a function of the FEF, it is nevertheless a point of great interest as it will become one of the tools by which further advancement at the university level will be possible.

6. **Permanent Financing**—It is evident to the FEF trustees that a campaign every three years for funds involves several disadvantages which must be overcome in a permanent financing plan. A permanent plan has been devised and approved. It is divided into three distinct units:

A. *Permanent Memberships*—Companies will be invited and urged to become permanent members of the FEF and to accept billings Oct. 15 each year for dues based upon their *then* employment. Inasmuch as this comes toward the end of the fiscal year in most companies it will permit a clear appraisal of their own situation. Membership dues and funds thus collected will constitute the amount of cash available for succeeding collegiate and foundation years. Thus funds collected in the fall of 1951 would generally apply to the 1952-53 fiscal year beginning May 1, 1952.

B. *Other Foundations*—It is believed that some of the existing foundations organized for charitable, scientific and educational purposes may, upon a suitable presentation, allocate some of their funds for scholarships through the FEF.

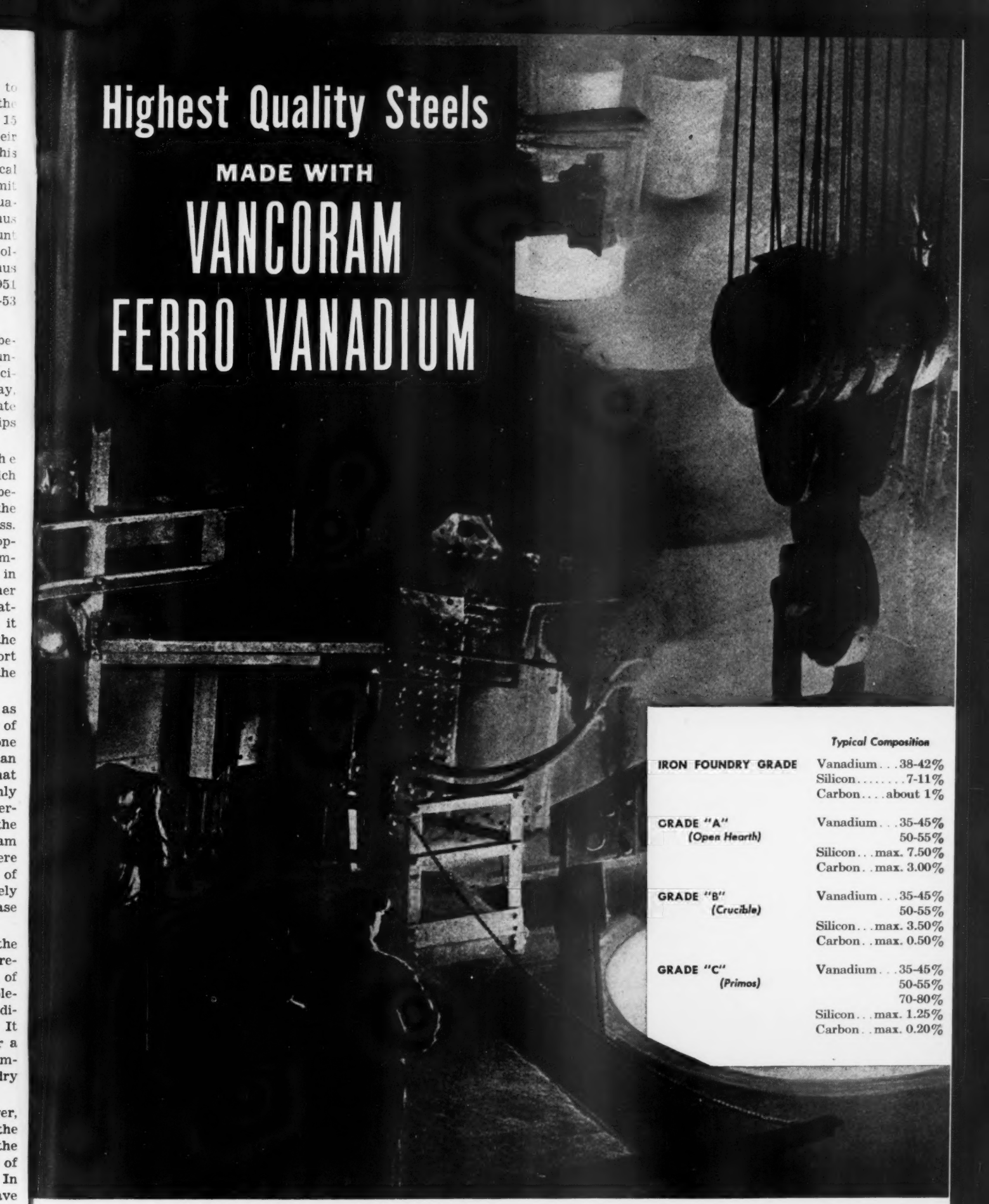
C. *Permanent Endowment*—The foundation offers a means by which men of our industry can make bequests to an agency designed for the betterment of the cast metals process. These gifts will be sought after proper attention has been given to memberships. The foundation is set up in such a manner that no legal or other difficulties are anticipated in activating a permanent fund. However, it would require 15 to 25 years for the fund to be large enough to support the activities contemplated by the foundation.

7. **Problems of Growth**—Strange as it may seem, the growth problem of the FEF seems to have become one of intelligent restriction rather than intelligent expansion. The fact that the foundry industry remains the only one actively associated with universities has created more than the hoped-for acceptance of our program among engineering colleges. There is a physical limit to the number of schools which can be adequately served without a tremendous increase in the staff expense, however.

It should be remembered that the progress of the FEF has been the result of the directed co-operation of its founding members and the wholehearted support of hundreds of individuals in the foundry industry. It can only exist in the future under a continuation of these happy circumstances with co-operation of foundry managers and owners.

Too much cannot be said, however, for the very fine work done by the schools themselves and especially the staff associated with the teaching of foundry science and technology. In the short space of four years we have gone from literally no men directly concerned to an excellent group of some 30 professors and instructors devoting their talents to the further improvement of foundry teaching.

CENTRAL NEW YORK Chapter of the AFS met Apr. 13 at Cornell University, Ithaca, N. Y., to honor and present a plaque to Dr. Heinrich Ries for outstanding work in sand research and for other valuable contributions to the foundry industry. Dr. Ries, however, died Apr. 11 and the plaque was presented to his family. E. C. Zirzow, Werner G. Smith Inc., Cleveland, speaker for the evening paid tribute to Dr. Ries and reviewed the development and application of sand tests. Shown at the meeting, left to right, are: D. J. Merwin, chapter secretary; David Dudgeon Jr., chairman; Lloyd D. Wright, national director, holding the plaque, and William D. Dunn, vice chairman



	Typical Composition
IRON FOUNDRY GRADE	Vanadium . . . 38-42% Silicon . . . . . 7-11% Carbon . . . . about 1%
GRADE "A" *(Open Hearth)*	Vanadium . . . 35-45% 50-55% Silicon . . . max. 7.50% Carbon . . max. 3.00%
GRADE "B" *(Crucible)*	Vanadium . . . 35-45% 50-55% Silicon . . . max. 3.50% Carbon . . max. 0.50%
GRADE "C" *(Primos)*	Vanadium . . . 35-45% 50-55% 70-80% Silicon . . . max. 1.25% Carbon . . max. 0.20%

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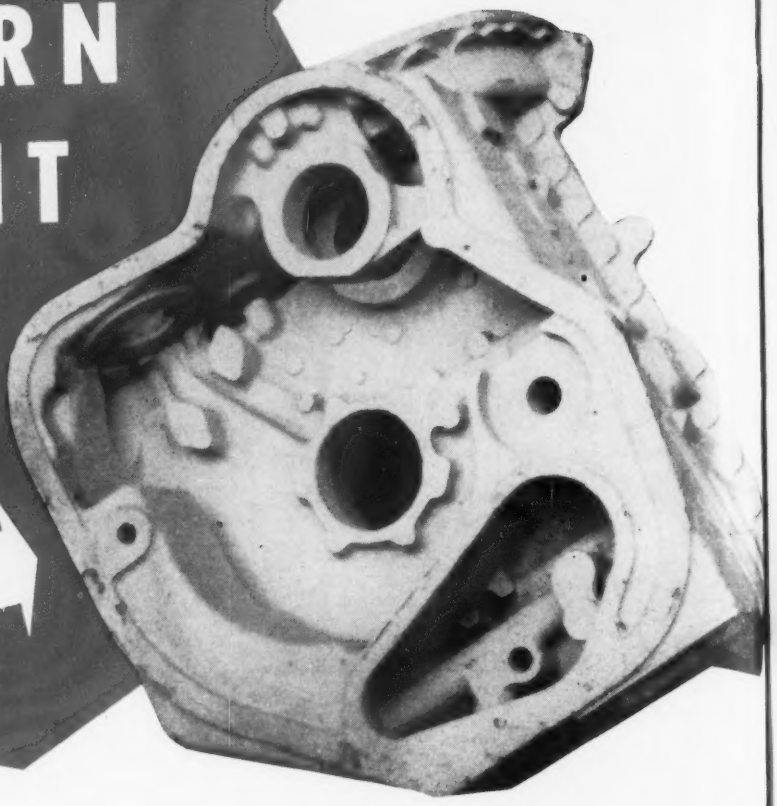
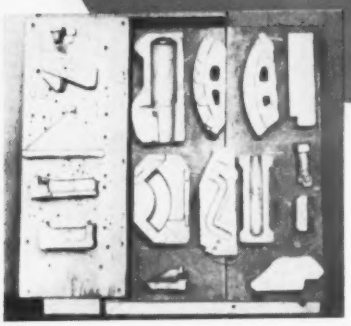
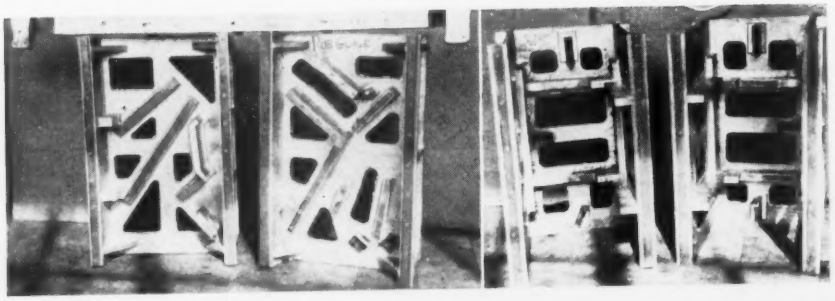
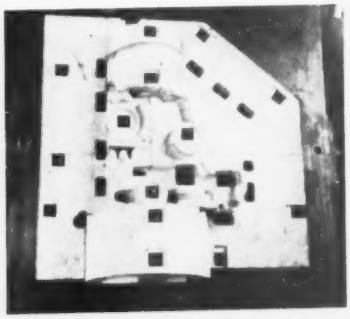




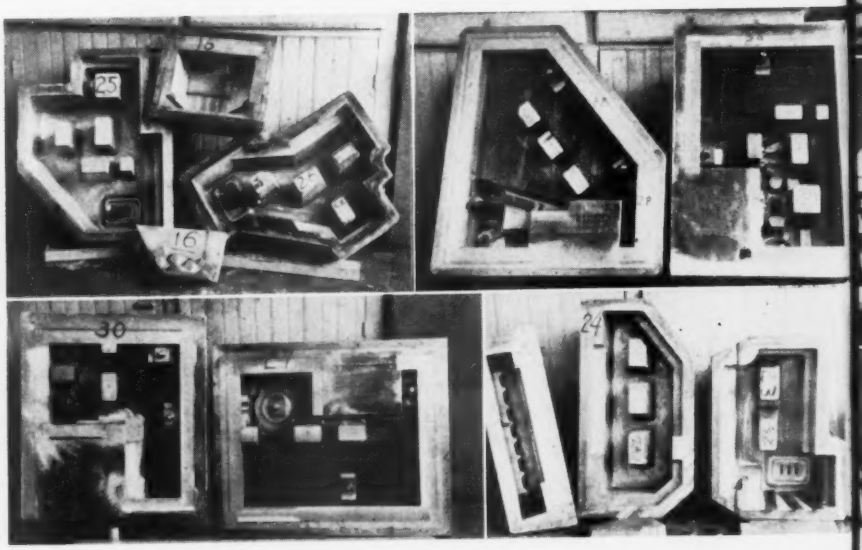
Drier patterns

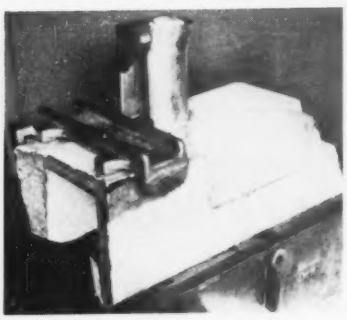


Core rubbing fixtures



Cope plate core assembly





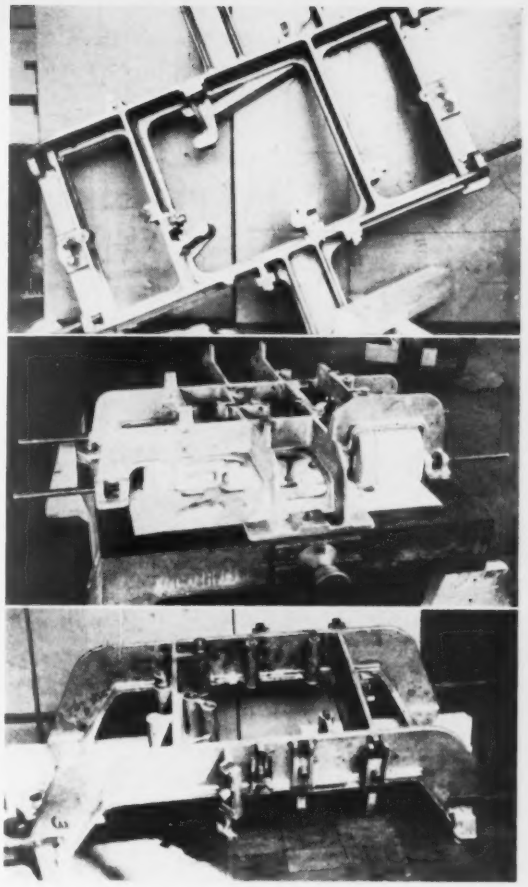
Core pasting fixture

Riser boxes

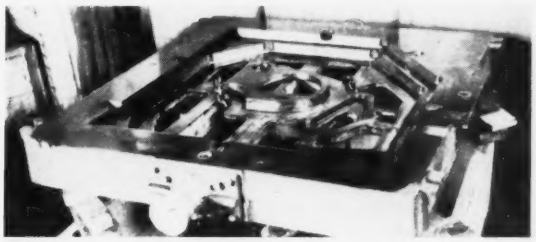
MAGNITUDE of the job involved in tooling up for the production of military weapons is indicated to a slight extent by the accompanying illustrations. They show only part of the pattern and related equipment furnished by the Motor Patterns Co., Cleveland, for the production of one of the three aluminum castings comprising the transmission housing of an armored tank. This casting—40-in. diam, 18 in. deep and weighing 225 pounds—is shown at the left.

The complete equipment supplied by Motor Patterns Co. for this casting included: 46 steel-stripped aluminum coreboxes, 138 loose pieces for coreboxes, 15 aluminum drier patterns, 13 metal drier fitting slugs, 2 plaster drier fitting slugs, 6 core rubbing jigs, 6 core grinding fixtures, 300 aluminum driers, 200 cast iron chills, 13 aluminum chill patterns, 1 complete set of plaster cores, 10 sets of cope and drag assembly plates, 1 steel pressure testing fixture, 1 complete set of wood master patterns.

Production of this equipment required eight months and approximately 22,000 man-hours of labor. The fact that the preponderance of this work can be done only by skilled men supports the contention of pattern manufacturers that the defense program will best be supported by keeping the patternmaker in the shop instead of inducting him into the armed forces.

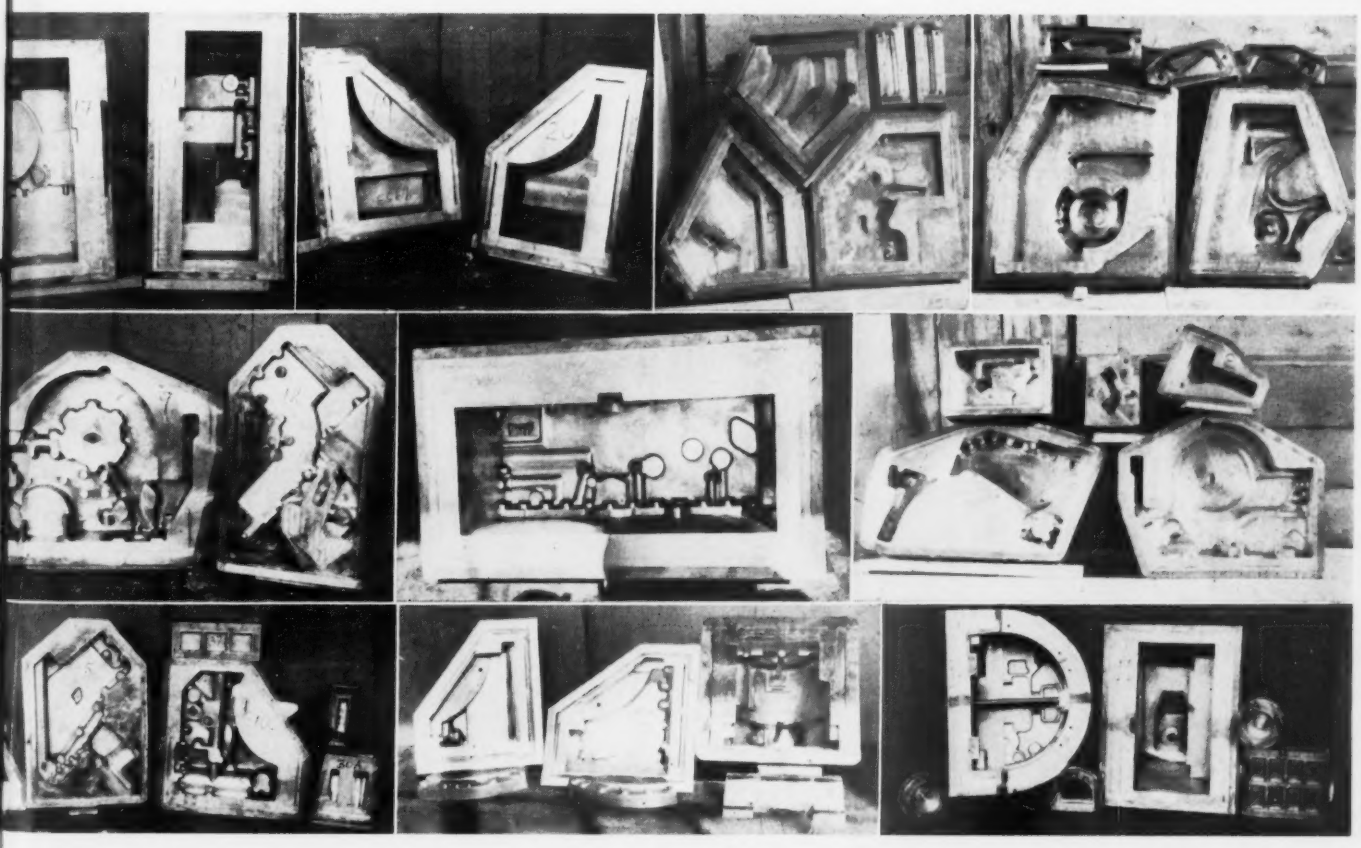


Core checking fixtures



Drag Plate

(Below)—Some of the 46 coreboxes



Activities of Foundry

GROUPS

Northwestern Pennsylvania

ON May 28 the Northwestern Pennsylvania Chapter of the AFS concluded its season with 175 members and guests attending Top Management Night, at the Moose Club, Erie. City, country and industrial leaders joined the membership, to hear three speakers, including Clarence Pulling, mayor of Erie, Walter Seelbach, new president, American Foundrymen's Society, and Frank G. Steinebach, editor, FOUNDRY.

Mayor Pulling stressed importance of the foundry industry in Erie and attributed much of the growth and prosperity of the community to its foundries. From a small furnace started in 1833, the community now numbers 27 foundries. President Seelbach outlined the advantages of membership in the AFS, the help it has been to the industry, and the part the society is playing today in the national emergency. He urged members to keep in touch with their representatives in Washington, to check legislation that appears socialistic.

Mr. Steinebach, in his talk entitled "What's Ahead," related instances of confusion pertaining to directives issued by government agencies not acquainted with problems of the foundry industry and stated that only by work of the foundry committees in Washington were they being held to a minimum. Since the war various trade societies within the foundry industry have co-operated to effect benefits.

At the annual chapter election these officers were elected: Chairman, Douglas James, Cooper-Bessemer Corp., Grove City; vice chairman, Fred Carlson, Weil-McLain Co.; treasurer, Clyde Cooper, Keystone Brass Co.; secretary, Bailey Herrington, Hickman, Williams & Co., the latter three companies all of Erie. New directors include: Frank Volgstadt, Griswold Mfg. Co.; Roy A. Loder, Erie Malleable Iron Co.; Jake Diemert, Erie Castings Co.; Theodore Fritts, National Erie Co.; and David Fourspring, Read Standard Co., all of Erie.

Following the election, retiring Chapter Chairman Frank Volgstadt thanked the officers for their loyal support during the past year, acknowledging Earl Strick who has been secretary for the past 6 years and who previously served as vice chairman, chairman, and director. Mr. James, the new chairman, introduced Carl Vaupel, resident manager, Cooper-Bessemer Corp., Grove City, who acted as toastmaster and introduced the visiting dignitaries, including Thomas Egan, and M. J. O'Brien, national directors. Past chairmen's pins were presented to Joseph Shuffstall and Frank Volgstadt. — *Earl Strick, Erie Malleable Iron Co.*

Wisconsin

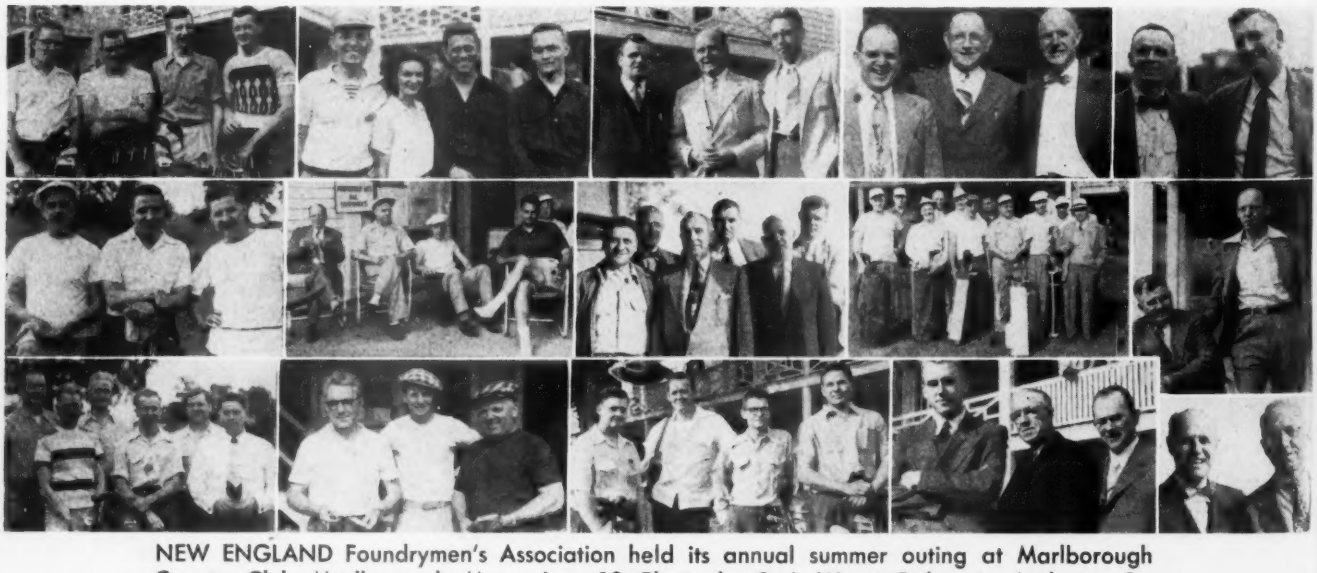
ANNUAL old timers' banquet of Wisconsin Chapter of the AFS was held at Hotel Schroeder, Milwaukee on May 11. The chapter now has more than 100 old timers who have received a bronze plaque mounted on walnut. These men have been associated with the foundry industry for 50 years or more. In addition, apprentices who had just graduated were awarded certificates.

The chapter's newly elected officers are: President, George E. Tisdale, Zenith Foundry Co.; vice president, Joseph G. Risney, Risney Foundry Equipment Co.; secretary, A. F. Pfeiffer, Allis-Chalmers Mfg. Co.; treasurer, Leonard Gratz, G & O Pattern Works. New directors elected to serve three years are: Leon H. Decker, Allis-Chalmers Mfg. Co.; and Charles E. Stull, Pelton Steel Castings Co.— *John E. Hubel*

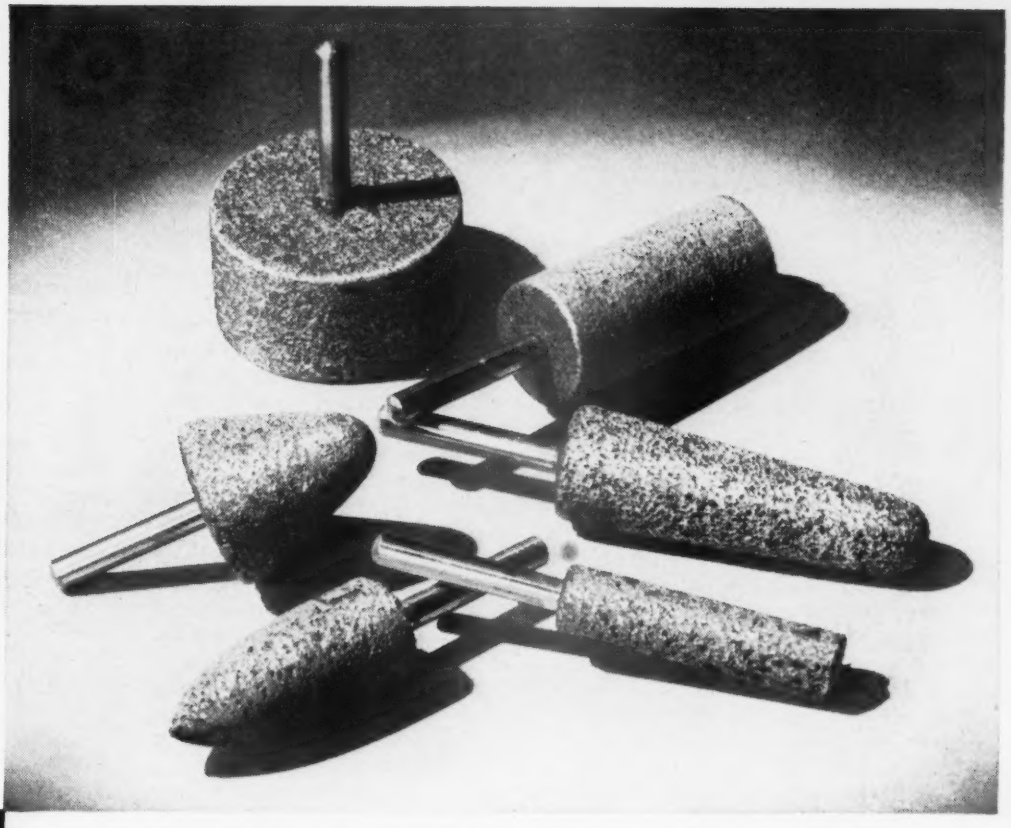
Michigan State

SECOND annual Student-Industry banquet of Michigan State Student Chapter of the AFS was held May 16 at the college's Union Building. Purpose of the dinner is to let foundrymen meet the men who will soon be working for them and to enable the students to get acquainted with their future employers. Principal speaker was Prof. Jim Hayes of the

(*Continued on page* 146)



NEW ENGLAND Foundrymen's Association held its annual summer outing at Marlborough Country Club, Marlborough, Mass., June 13. Photos by C. A. Wyatt, Debevoise-Anderson Co.



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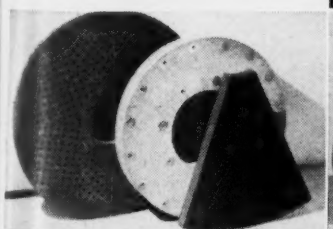

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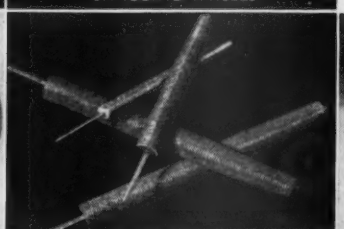
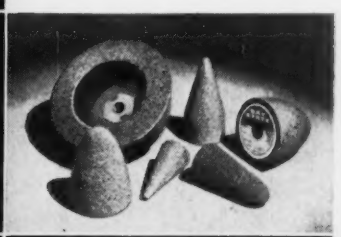


CORE FILES



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(*Continued from page* 144)
school's dairy department. His talk was entitled, "The Cow with the Cast Iron Stomach."

George Dreher, executive director of the Foundry Educational Foundation, Collins Carter, president, Albion Malleable Iron Co., and industrial advisor to the chapter, H. F. Scobie, representing AFS headquarters, and Harry W. Dietert, president, Harry W. Dietert Co., spoke briefly.—*Gene Rundell*

Eastern New York

ANNUAL election of officers was held by Eastern New York Chapter of the AFS at its May 15 meeting. Those elected are: Chairman, John E. Waugh, General Electric Co., Schenectady, N. Y.; vice chairman, Leigh Townley, Adirondack Foundries & Steel, Watervliet, N. Y.; secretary-treasurer, Ed. Lawrence, General Electric Co., Schenectady.

Guest speaker was Howard Nye, Crompton & Knowles Loom Works, Worcester, Mass., who led a round table discussion. Mr. Nye opened his remarks by describing a particular problem which arose at Crompton & Knowles and the steps which were taken to meet it. From that point the discussion branched out to include such phases as operation, cost analysis, price setting, personnel problems, and training courses for both apprentices and foremen.—*Leigh M. Townley, Adirondack Foundries & Steel Inc.*

Quad City

AT the May 21 meeting of the chapter held at Fort Armstrong Hotel, Rock Island, Ill., Frank G. Steinebach, editor of FOUNDRY was the principal speaker. In his talk entitled, "What's Ahead," Mr. Steinebach outlined what had occurred during World War II in the various government bureaus such as the WPB, OPA, etc., particularly in regard to foundry supplies such as scrap coke, pig iron, alloys and equipment.

Korea came too soon to permit the desired organization of the various foundry groups into a united, compact unit so some of the problems encountered during World War II still exist in the new defense setup. At present, however, foundry society cooperation is good and the industry as a whole is in a better position to cope with the problems than it was at any time during World War II.

Foundrymen are confronted with the following possibilities: Limited war in which capacity will be divided between defense and civilian production; all out war demanding full war production; or sudden peace. Any of these alternatives will be tough on foundries. Mr. Steinebach suggested that foundries get defense work because by that means only are priorities available with which to obtain necessary supplies and equipment. In conclusion the speaker stressed the production of quality castings to meet the challenge of forgings, weldments and other fabricating methods.—*E. C. Zirzow, Deere & Co.*

Central Indiana

AT the May meeting of Central Indiana Chapter of the AFS, past chairmen of the chapter were honored. In addition, H. E. Gravlin, assistant plant manager, and R. W. Gardner, quality control division of Dearborn foundry, Ford Motor Co., Dearborn, Mich., presented the film, "Iron Ore to Motive Power" after which they discussed statistical quality control in the foundry. They pointed out that while this means of control is no cure-all for foundry troubles, it does serve as a guide to supervision in anticipating and finding troubles.

Officers elected for the coming year are: Chairman, Robert Spurgin III, Swayne, Robinson & Co., Richmond, Ind.; vice chairman, Carl O. Schopp, Link-Belt Co., Indianapolis; treasurer, Chester Sears, International Harvester Co., Indianapolis; and secretary, Fred E. Kurtz, Electric Steel Castings Co., Indianapolis. Directors elected for three years are: John P. Kemp, Hickman, Williams & Co., Indianapolis; R. E. Shirley, Indiana Foundry Corp., Muncie, Ind.; H. O. Bailey, Sonith Industries, Indianapolis; and H. S. Taylor, Frederic B. Stevens Inc., Indianapolis. Retiring chairman, Allen Reid, General Refractories, Indianapolis, will serve as a director for one year.—*Paul V. Faulk, Electric Steel Castings Co.*

CENTRAL INDIANA Chapter of the AFS honored past chairmen at its May meeting. Top, left to right: Richard Bancroft, Perfect Circle Co., New Castle, Ind., 1943-44; B. P. Mulcahy, foundry consultant, Indianapolis, 1942-43; Ray S. Davis, National Malleable & Steel Castings Co., Indianapolis, 1945-46; Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Indianapolis, 1948-49 and Franklin Swain, Golden Foundry Co., Columbus, Ind., 1949-50. Lower view shows 1951-52 officers. Left to right: Chester Sears, International Harvester Co., Indianapolis, treasurer; Fred E. Kurtz, Electric Steel Castings Co., Indianapolis, secretary; Robert Spurgin III, Swayne, Robinson & Co., Richmond, Ind., chairman, and Carl O. Schopp, Link-Belt Co., Indianapolis, vice chairman.
Photos by Henry O. Yeager, International Harvester Co.

Philadelphia

FINAL meeting of the current season for Philadelphia Chapter of the AFS was held May 11 at the Engineers Club, and 125 members were present.

Group leaders for iron, steel, brass and bronze were assembled in one room for general discussion of foundry problems. Daniel Talbot, Cooper Alloy Foundry Co., Hillside, N. J., was discussion leader for steel; Harold Ullrich, Sacks-Barlow Foundries, Newark, N. J., for gray iron; Roger Keeley, Ajax Metal Division of H. Kramer Co., led the discussion for the nonferrous group.

The following have been elected chapter officers for the coming year:

(*Concluded on page* 148)

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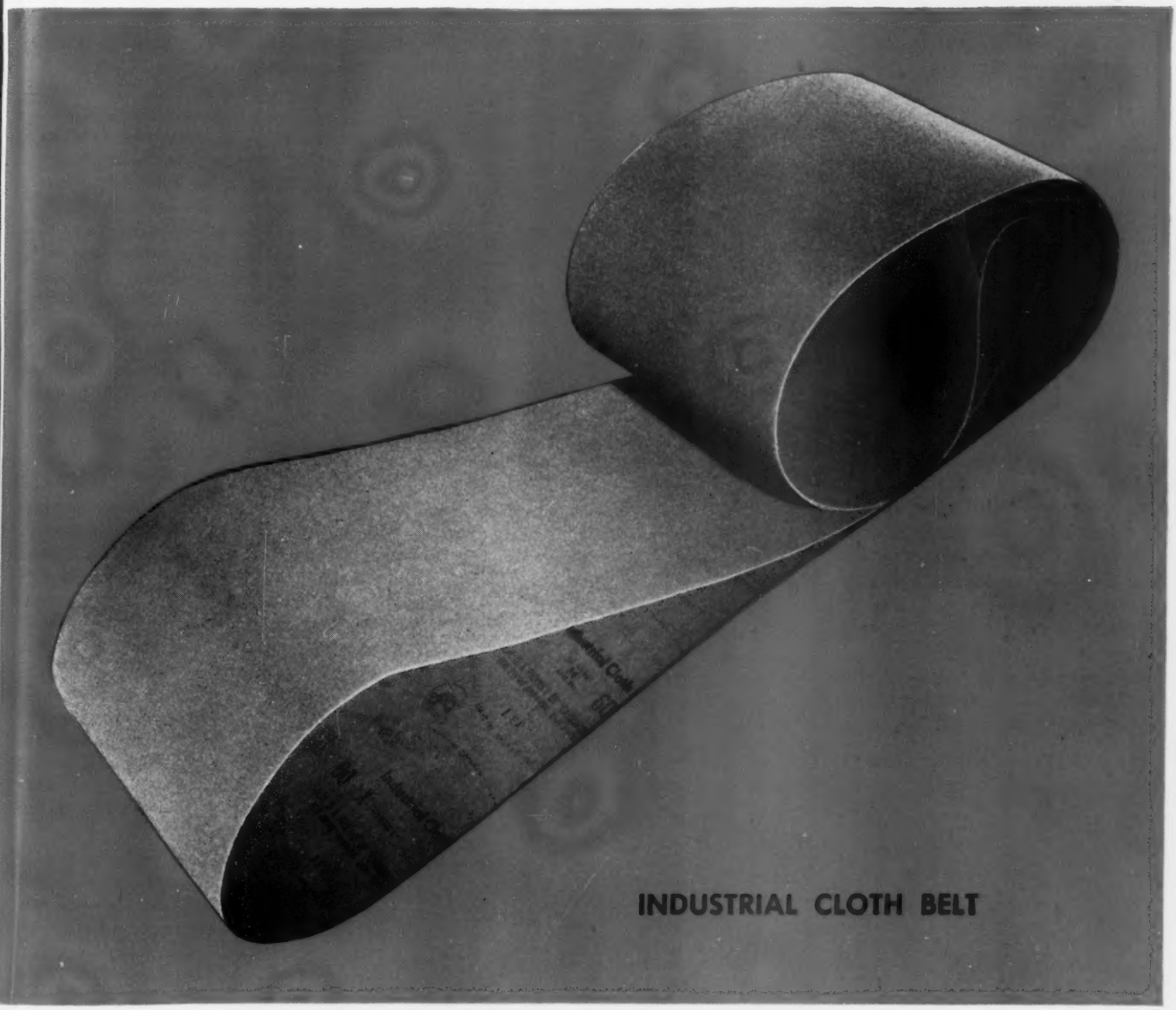

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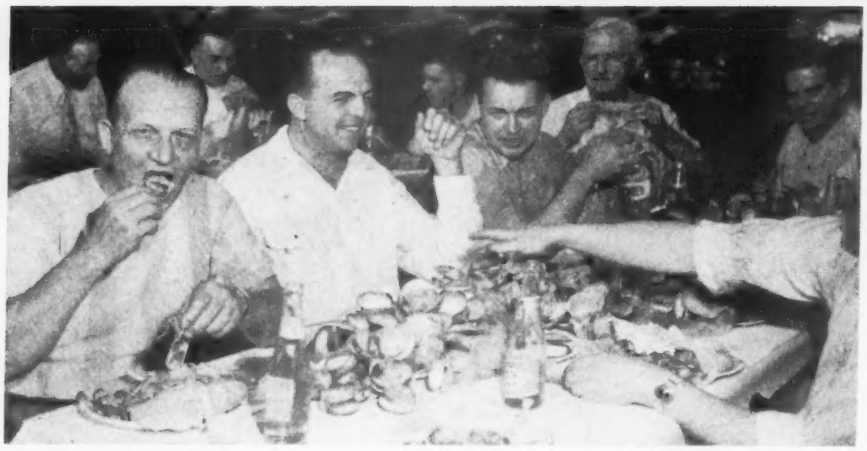


CENTRAL ILLINOIS Chapter of the AFS held its annual clambake June 9 at the VFW post home, Morton, Ill. Golf, horseshoe pitching, and the clambake were features of the day. Photo by Fred Brosmer, Caterpillar Tractor Co.

(*Concluded from page* 146)

Chairman, G. H. Bradshaw, Philadelphia Naval Yard; vice chairman, A. N. Kraft, Wilkening Mfg. Co.; secretary-treasurer, W. B. Coleman, W. B. Coleman & Co. Directors of the chapter are: C. B. Jenni, A. A. Thum, W. D. Bryden, J. N. Lanning, W. F. Graden, C. O. Butler, and D. E. Best. —*G. H. Bradshaw, Philadelphia Naval Yard*

Northern California

CONCLUDING business meeting of the year for Northern California Chapter of the AFS was held May 18 at Hotel Shattuck, Berkeley. John Russo, retiring chapter president, was commended on his leadership during the year and attention was called to the remarkable increase in chapter membership.

Guest speaker was Lawrence Pridmore, International Molding Machine Co., La Grange Park, Ill., who spoke on the "Fundamentals of Core Blowing." Mr. Pridmore outlined venting of coreboxes and discussed improvements which could be made in blowing cores.

At the annual Ladies Night, held June 15 at the Sequoyah Country Club, Oakland, a record turnout of 190 members and guests attended the dinner and dance following. Ed Brumley, Brumley-Donaldson Co., and Clayton Russell, Phoenix Iron Works, co-chairman, directed the entertainment for the party which was considered one of the most successful ever held by the chapter. During the evening Philip C. Rodger, General Metals Corp., Metals Division, incoming chapter chairman, presented to outgoing Chapter Chairman John Russo, Russo Foundry Equipment Co, an automatic coffee maker in appreciation for his splendid work in heading the group during the year.—*J. M. Snyder, Jos. Musto Sons-Keenan Co.*

TEXAS CHAPTER of the AFS held its business meeting May 18 in Houston. Left to right are: W. H. Lyne, Hughes Tool Co., Houston, retiring chairman; John Bird, American Brass Foundry, Fort Worth, Tex., newly elected chairman; and Robert Whittlinger, Pioneer Iron, Houston

Western New York

ANNUAL election of officers and directors of Western New York Chapter of the AFS was held at Hotel Sheraton, Buffalo on May 10. Erwin Deutschlander, Worthington Pump & Machinery Corp., was elected chairman; Carl A. Harmon, Hanna Furnace Corp., vice chairman; Roger E. Walsh, Hickman, Williams & Co. and Martin W. Pohlman, Pohlman Foundry Co., were re-elected secretary and treasurer respectively. Directors elected to serve three years are: William P. Quinn, Pratt & Letchworth Inc.; Leonard Greenfield, Samuel Greenfield Co. and Joseph Zahm, Master Pneumatic Tool Co. Alfred A. Diebold, retiring chairman, was elected director for one year.

Following the election, Mr. Diebold expressed appreciation to the various committee heads and officers who assisted in making his term of office a success and to the committees functioning for the AFS convention.

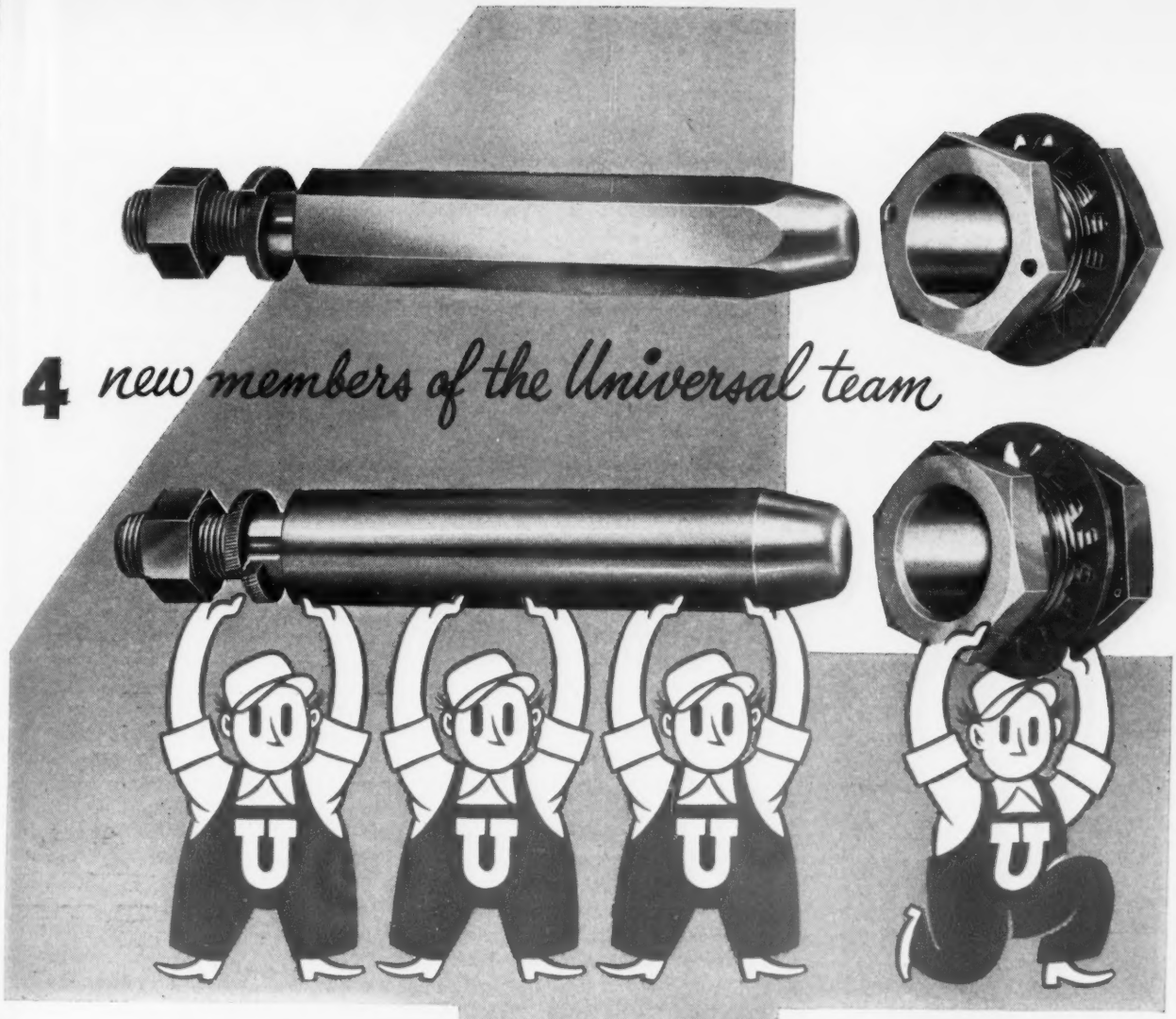
Feature of the meeting was the showing of the AFS technicolor film, "The Flow of Molten Metal."

Joseph Zahm, chairman of the membership committee, announced that the chapter's membership now exceeds the quota set by national headquarters.—*Marve Taublieb, Frederic B. Stevens Inc.*

Eastern Canada

AT the annual election of officers of Eastern Canada Chapter of the AFS held at its regular May meeting, W. T. Shute, Canadian Car & Foundry Co., Westmount, Que., was elected chairman; A. J. Moore, Montreal Bronze Ltd., Montreal, vice chairman; Alfred H. Lewis, Dominion Engineering Works Ltd., Montreal, re-elected secretary and Willet Tibbits, Canadian Car & Foundry Co. Ltd., treasurer. Newly elected directors are: Claude J. Bourassa, C. J. Converse, W. C. H. Dunn, L. N. McEntush and J. L. Slater.

Marc Boyer, deputy minister of Mines and Technical Services, Ottawa, Ont., was principal speaker, and I. R. Wagner, Electric Steel Castings Co., Indianapolis, and vice president-elect of the AFS, was a special guest. Both speakers paid tribute to three Montreal foundrymen who won prizes in the society's annual apprentice molding and patternmaking contests. They are: John G. Polino, Dominion Engineering Works Ltd., first prize winner in steel molding; Gilbert Dandoy, Montreal Bronze Ltd., and F. Grant Wilcox, Dominion Engineering Works Ltd., second and third prize winners respectively in the nonferrous molding division. — *Roy Carmichael*



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IMPACT STRENGTH O

By HARRY W. DIETERT
President
Harry W. Dietert Co.
Detroit

THE question frequently arises as to what type of strength test one should use for determining the bond strength of molding sands. Recently W. H. Moore* suggested the use of impact strength testing for determining the hot toughness of sands at elevated temperatures. The author has used impact strength testing for measuring the green strength of molding sands. It is of interest to know how shear, compression, tensile and impact strength tests compare with each other and which method of strength testing is the better.

Impact Testing—the impact tester used by the author is shown in Fig. 1. It has an arm length so that the striking edge is 10¾ in. from center of rotation. The striking member has a curved contact face ½-in. wide striking the upper ½-in. of the specimen. The specimen is held for a distance of ½-in. within the specimen tube, causing 1½ in. of specimen to project from the tube. The specimen is stripped in the test position and is 60 degrees from the horizontal plane.

Impact strength of molding sand is very small, in the order of 0.8 per cent of the gross impact energy, so that it is highly desirable to reduce the throw energy of the broken sand specimen to a minimum since the throw energy is as much as four times greater than the actual impact strength of some sands. Having the sand specimen placed at a 60 degree angle makes for a minimum of throw energy. The center of percussion of the impact tester arm is at the center of the striker.

Impact strength is read in inch-pounds energy required to break the protruding portion of the sand specimen. The throw energy of the broken sand specimen is subtracted from the gross impact reading yielding net impact strength. If this is not done for the ¾ and 1⅛-in. diameter specimens, the impact test reading is largely throw energy and the test becomes very insensitive to a change in the bond strength. The gross impact strength reading may be used for control testing when the 2 x 2-in. specimen is used and only the upper portion of the sand specimen is broken, making for a minimum of throw energy.

A large group of striker designs have been investigated, ranging from narrow striking edges to broad-faced strikers. A striker with a ½-in. face and possessing a curved face fitting the OD of the sand specimen was found the best.

One other very important item was checked which dealt with the effect of sand specimen size on sensitivity of the impact test.

Three sizes of molding sand specimens have received study:

1. AFS standard specimen 2 x 2 in.
2. AFS tentative standard specimen 1⅛ x 2 in.
3. W. H. Moore suggested specimen ¾ x 2 in.

The 2 x 2-in. specimen showed the best sensitivity and was the easiest to handle. This applies only to green sand strength testing.

Molding Sands Studied—The group of sands used in this strength test evaluation consisted of five foundry production sands which are in actual foundry use.

Sand "A" is a natural bonded molding sand used for casting aluminum. Sand "B" is a natural bonded sand used for green sand molds for casting medium weight gray iron castings. Sand "C" is a natural bonded sand used for dry sand molds for large iron castings. Sand "D" is a synthetic bonded green sand and is used for casting medium weight steel castings. Sand "E" is synthetic bonded system sand used for medium weight gray iron castings.

This group of sands gave a wide

*FOUNDRY, January, 1951, p. 152. AFS 1951 annual meeting, Report No. 51-30.

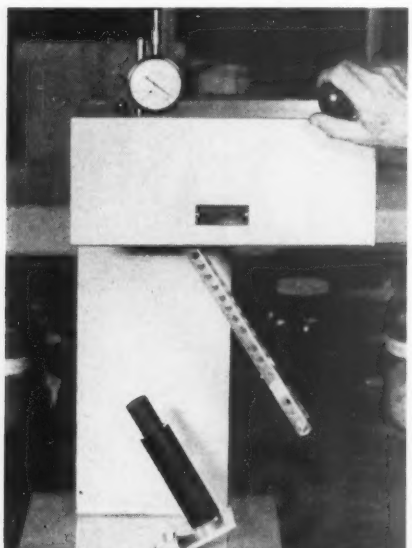
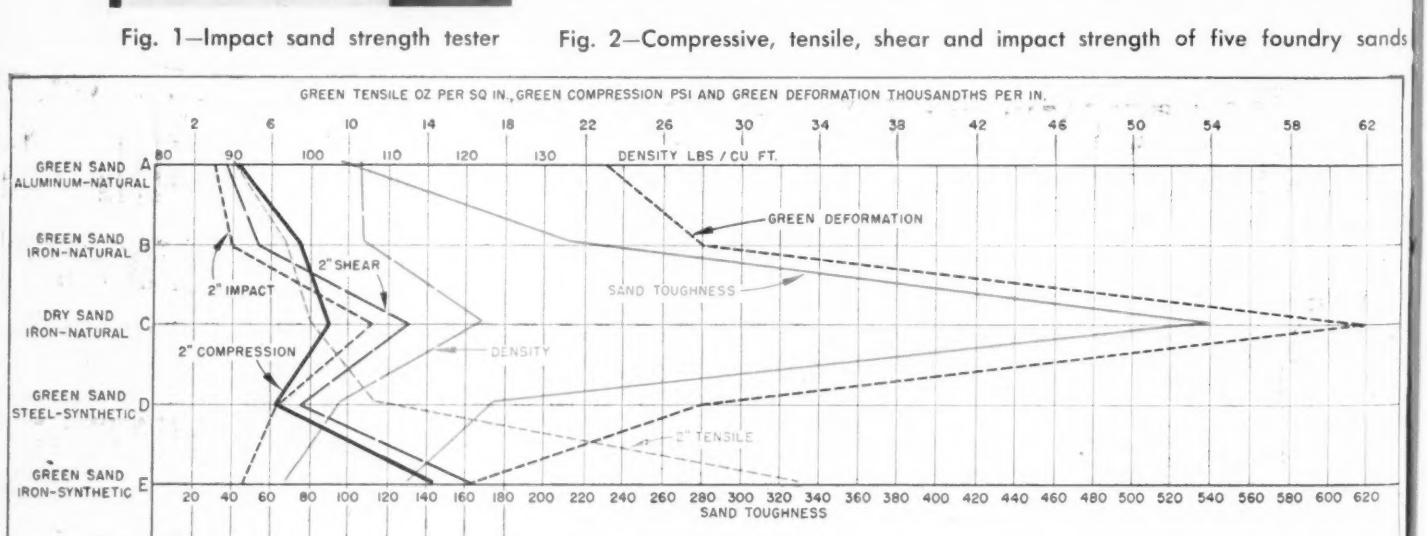


Fig. 1—Impact sand strength tester

Fig. 2—Compressive, tensile, shear and impact strength of five foundry sands


GREEN TENSILE OZ PER SQ IN., GREEN COMPRESSION PSI AND GREEN DEFORMATION THOUSANDTHS PER IN.
2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
80 90 100 110 120 130 DENSITY LBS / CU FT.
GREEN SAND ALUMINUM-NATURAL A
GREEN SAND IRON-NATURAL B
DRY SAND IRON-NATURAL C
GREEN SAND STEEL-SYNTHETIC D
GREEN SAND IRON-SYNTHETIC E
GREEN DEFORMATION
2" SHEAR
2" IMPACT
SAND TOUGHNESS
2" COMPRESSION
DENSITY
2" TENSILE
20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620
SAND TOUGHNESS
.0 .5 .10 .15 .20 .25 .30 .35 .40 .45 2" IMPACT IN LB PER SQ IN.
.0 .4 .8 1.2 1.6 2.0 2.4 2.8 3.2 3.6 SHEAR PSI.

spread in properties such as fineness, permeability, green strength and deformation (plasticity).

Compression vs. Tensile—Compressive strength of these five sands ranged from 4.3 to 14.1 psi, showing an increase of 3.28 times; tensile strength ranged from 4.1 to 33.3 oz per sq in., equivalent to an increase of 8.1 times. Thus, the tensile strength test is more sensitive than compression alone. This is graphically illustrated in Fig. 2; and for those who like numerical values, Table I will be found convenient for study. It may be noted that both the compressive strength test and tensile strength test agree in selecting the order of strength of the various sands with exception of sand "D"—where tensile test shows a continued increase, the compression test shows a lower order of strength.

Compression vs. Shear—The shear strength test ranged from a low of 0.75 to a high of 3.32 psi or an increase of 4.4 times compared with an increase of 3.28 times for compression. A study of the test data in table I or a study of the graphs in. Fig. 2 will show that there is very little difference between compression and shear for all practical purposes. However, the shear strengths of high colloidial bonds will show higher strength values than compressive strength would indicate.

Compression vs. Impact—The 2 x 2 in. specimen held at 60 degree angle where the impact break occurs in the upper portion proved the most sensitive impact test and will be used for comparative study.

The 2 x 2 in. impact strength test ranged from a low of 0.08 in.-lb for sand "A" to a high of 0.28 in.-lb for sand "C." This is an increase of 3.5 times. The compression test showed an increase of 3.28 times from sand "A" to sand "E." The net impact strength of a sand is very small. It requires very careful manipulation to arrive at the throw energy which is subtracted from the gross impact reading to obtain the actual net impact strength. The throw energy is a function of the mass of the sand broken off which is thrown and also of how the broken sand shattered.

The sand "E" is highest in compression, shear and tensile. However, impact rates this sand low in strength, partly due to its comparatively low deformation. The hand-feel test places this sand as a high-strength sand. Incidentally, this sand is an exceptionally low casting loss sand. This sand undoubtedly has a low strength for impact loads and knowing this may have practical value.

TABLE I—Compressive, Tensile, Shear and Impact Strength of Five Foundry Sands

Sand	A Green Sand Nat. Bonded Aluminum	B Green Sand Nat. Bonded Iron	C Dry Sand Nat. Bonded Iron	D Green Sand Syn. Bonded Steel	E Green Sand Syn. Bonded Iron	Ratio Minimum to Maximum
Green compression, psi.	4.3	7.6	9.0	6.2	14.1	3.28
Green deformation, thousandth in./in..	0.023	0.028	0.062	0.28	0.016	
Sand toughness	98.9	212.8	540	173.6	125	5.4
Shear, psi	0.75	1.17	2.6	1.52	3.32	4.4
Tensile, oz per sq in...	4.1	6.9	8.0	11.4	33.3	8.1
2" diam specimen impact, in.-lb per sq in.	0.08	0.10	0.28	0.16	0.11	3.5
1¼" diam specimen impact, in.-lb per sq in.	0.07	0.10	0.19	0.15	0.12	2.7
¾" diam specimen impact, in.-lb per sq in.	0.13	0.20	0.31	0.25	0.21	2.3
Permeability, ml	17	75	17	160	212	
Density, lb/cu ft	106	106	122	104	97	

The impact strength values for the ¾-in.-diam specimen is appreciably higher than the values for the 1¼ or 2-in. diam specimens. It is recognized that the impact test is not dimensional. Thus, correlation on impact strength data on cross-sectional area is not expected. However, it could be possible to obtain closer correlation by bringing the degree of ramming of the ¾-in. specimen more nearly in line with the other specimen sizes.

Green Deformation and Sand Toughness—The plasticity of a molding sand plays a very important function in the workability and productivity of a sand. For this group of sands, the range of green deformation was from 0.016-in. for sand "E" to 0.060-in. for sand "C." Sand "E" is on the lower side of good workable plasticity, while sand "C" is a very plastic sand for dry sand molds.

To completely measure the workable strength of a sand, a strength test must show the difference in plasticity — that is, deformation. Multiplying the green deformation by green compressive strength and also by 1000 gives a product that is termed "sand toughness."

Referring to either Table I or Fig. 2, it becomes apparent that sand "C" has a very high workable strength. It is a very tough sand. The tensile strength test does not pick out this very definite strength property. Neither from the compression, shear or impact would one become aware that sand "C" has this high toughness. However, it is true that the impact strength test value does follow to some extent the trend of sand deformation or toughness. This is indicated in Fig. 2. Note that the graphs of sand toughness and impact strength are in fair agreement. However, from the impact strength one is not forceably reminded that the deformation and toughness vary greatly.

The deformation or toughness of a sand requires separate treatment apart from the actual bond strength. Thus, one single strength test value is not desirable from a control standpoint.

Summary:

1. The green compressive strength test together with green deformation gives more detailed information as to the workable strength of molding sands in a single package. These two test results allow one to control bond strength and plasticity separately. Thus, the two independent factors, bond strength and plasticity, are known and may be controlled separately, yielding a sand that is easiest to work and conducive to better casting quality.

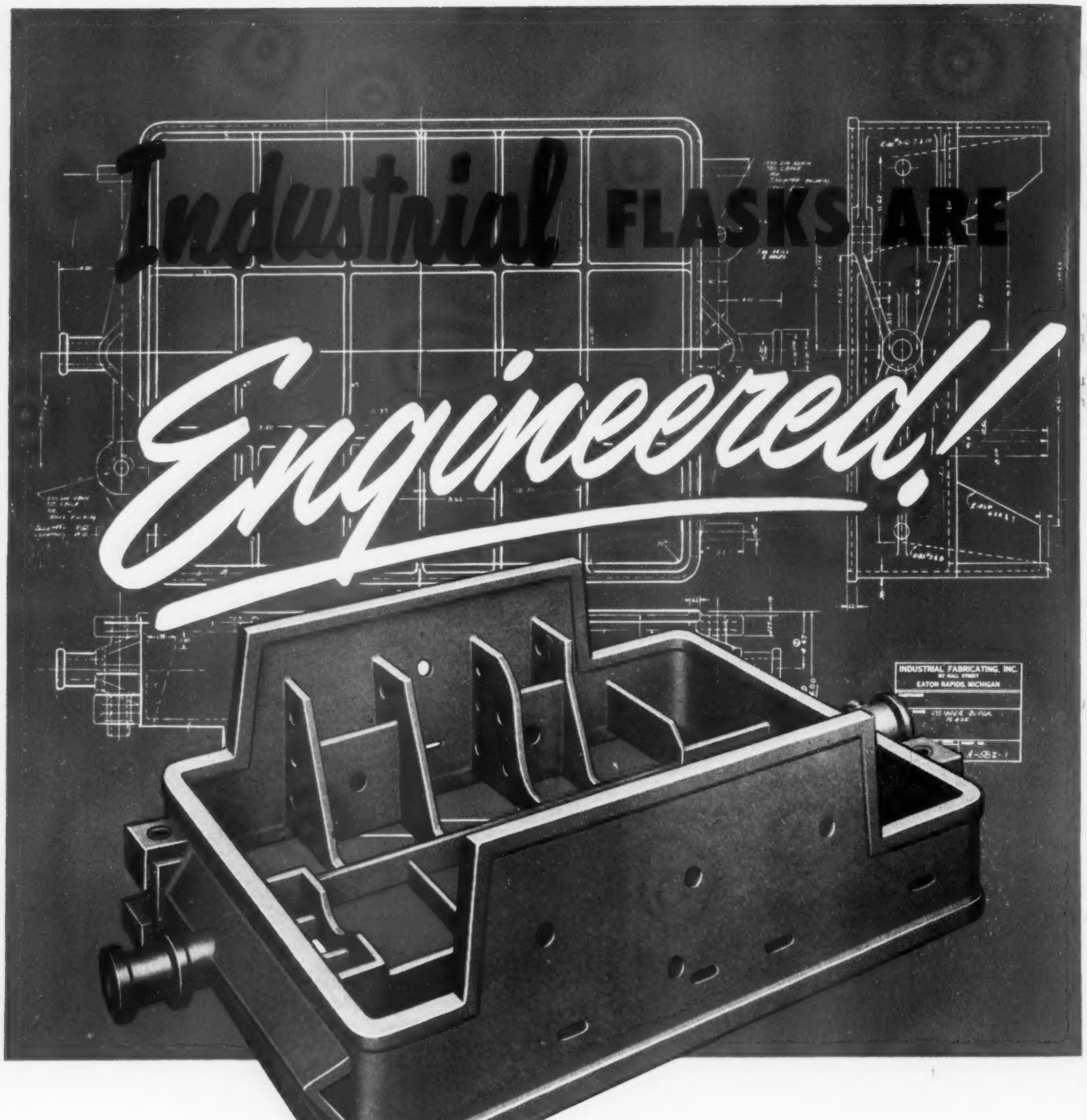
2. The green impact strength test can be quickly made on the 2 x 2 in. specimen when gross impact strength reading is used. It is slower than compression-deformation test when corrected for throw energy to obtain the actual net impact strength test values. Gross impact values could be used for control but should not be used for research testing or detailed controlled testing.

3. Green impact strength test is influenced by green deformation but not prominently enough to be used as a sand toughness number.

4. A sand may have a low impact strength even though good strength characteristics may be shown by the compressive, shear or tensile strength test.

5. Present-day knowledge of sand control places green compressive strength test with green deformation as the best for sand control in the foundry. No single strength test will give as much detailed information.

6. Impact strength test may have very specific applications in foundry sand control. Much more test work is required to evaluate fully the importance of knowing impact strength as well as compression and deformation.



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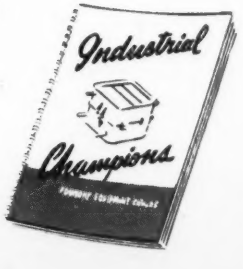

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Use of Core Sands

(Concluded from July issue)

MAXIMUM values of green bond, dry strength, permeability and texture (smoothness of surface) are not easily obtained in the same core sand mixture.

Sands having a high green bond are usually tight or require much binder. Open cores are frequently rough. It is necessary, therefore, to compromise on some properties to meet the castings' requirements.

Greatest heat resisting properties are obtained by the use of high-silica sands such as Ottawa, lake sands, silica flour, etc. Green bond and fine texture are obtained by using fine grain or by adding silica flour, molding sand or foundry floor sweepings (also called *runway* sand). Open cores are made from coarse, uniform grain sands bonded with clay or organic binders.

Coarse sands and clean silica sand mixtures require less binder to produce the desired dry strength than do mixtures containing molding or runway sand. This is particularly true of oil binders and in a less degree of water soluble and gum binders. This difference in binder requirements is highly important because oil binders may represent a quarter to a half the cost of a core sand mixture.

Core Characteristics Vary

Straight silica sands bonded with oil are less plastic than molding sand mixtures. Over ramming is less apt to produce tight cores, and differences in temper affect the hardness and permeability of the cores to a less degree. The cores are a little more brittle while green than those made from a molding sand mixture of the same green bond. This is due to the absence of colloidal material and may be remedied somewhat by use of water soluble binders where conditions permit. Such cores usually are removed from castings more readily than those containing mineral colloids.

However, certain advantages are gained by use of molding sands or small percentages of colloidal clay. Such mixtures afford maximum permeability for a given bond. They are adapted to jobs which must be very open and yet cannot be made from sands of low bond. This is due to the fact the needed green bond is obtained by coating the large grains of sharp sand with a quantity of very sticky clay which is small in comparison with the amount of non-colloidal but fine material required to produce the same bond. However, such clay absorbs considerable oil; hence, extra binder is required. Cores which must yield readily with shrinkage of the cooling metal are usually made from rosin-bonded sand. Rosin softens and is burned out at comparatively low temperatures.

Gray iron, aluminum, or wood core-boxes are usually used for ramming up cores. The tempered sand is pressed into the boxes by various methods; jolt or squeeze machines are used in some cases, in others the sand is blown in by core blowing machines, while in other cases the sand is tamped or jarred in by hand.

Selection of a method for forming cores will be governed by a number of factors, principally by the number of cores required and their size. Steady development in core blowing practice in recent years has made possible the production of relative large and intricate cores by this method, and when quantities needed are large, machine blowing offers important economies.

Cores of such shape and size that the bond alone cannot support them have wires or rods inserted to give them strength while green and after baking. These rods or wires are sometimes coated with molasses, paste or core oil so that the sand will stick to them. Cores are supported on metal plates until baked. These plates are sometimes of special designs to adapt them to support certain shapes. These special shapes are called core driers. Cores so designed that sand cannot be properly rammed into all corners and pockets are made in halves. Each half of the box is rammed up separately, the surfaces struck off, then pressed firmly together, an operation called "booking the core."

Thin plates, called "filler" plates, sometimes are fitted on the edges of one of the half boxes when the cores are to be booked. This increases the depth of the box slightly. After ramming the sand and striking it off, this plate is removed. The practice gives greater pressure of contact between the two core halves when they are joined, so that better union is obtained. These filler plates usually are used for smaller cores—up to 2 inches in diameter.

When a fine tight sand must be used to get smooth surfaces and there is a tendency for the core to blow, artificial vents are made. These usually can be made by thrusting a blunt wire into the core after it has been rammed up and then withdrawing it. If the section is small and the vent must be carefully located, the core is rammed up in halves, the vent wire laid in, the halves pressed together and rapped, then the wire is pulled out. Strings of vent wax are sometimes laid in and allowed to remain until the baking process melts or evaporates the wax, leaving a vent for gases.

Facing and backing sands are used in large cores as in molds to provide smooth or hard surfaces and yet permit escape of core and mold gases. The interior of large cores is sometimes filled with cinders, crushed coke, or weak bonded sand to provide vent for core gases and also to allow the core to yield during solidification of the metal.

Collapsibility Is Important

The removal of cores from castings is facilitated by the use of a soft center or non-bonded material. In certain types of castings in which access to interior passages is difficult it is highly essential that the cores collapse readily.

Where cores are to be pasted together a strong paste is used. The most commonly used is dextrin. There are many registered trade names for paste but most of the products have the dextrin base.

Cores usually are baked at temperatures ranging from 300 to 450° F. Baking temperature is governed, first, by the type of bond in the cores and, second, by local conditions. In a production shop, the baking naturally is forced, and the temperature brought up to the highest degree commensurate with safety. In this case greater care must be taken in choosing the binder.

In jobbing shops where different types of cores are made requiring widely different kinds of binder, and where all the cores are baked in the same oven, the temperature must be held lower. However, it should be remembered that where oil is used the temperature must be kept high enough to drive off the moisture rapidly and speed up the union of oxygen with the oil inasmuch as it is useless as a binder unless it is oxidized. With synthetic resins the baking operation results in a chemical change in the resin called polymerization which forms a different compound.

By EDWIN BREMER

Foundry DEVELOPMENTS

INVESTIGATION of boron-treated steels by Yunoshin and Hikotaro Imai, and reported in *Science Reports* of the Research Institutes, Tohoku University, Sendai, Japan, indicates that the maximum hardenability is obtained with addition of boron in the order of 0.003 per cent; it declines sharply with further increase. When nitrogen content is more than 0.008 per cent effect of boron on hardenability decreases, until at 0.02 per cent it is practically nil. This is due to fixation of boron as a nitride, leaving little soluble active boron. Steels strongly deoxidized and denitrogenized by additions of aluminum or titanium prior to boron addition show effect of the latter more markedly. Required amount of aluminum is 0.1 per cent at least. Titanium is more effective than aluminum, and addition of as little as 0.03 per cent shows its effect clearly.

♦ ♦ ♦

RECENT announcement by Carpenter Steel Co. that additions of cerium or misch metal to difficult-to-work high-alloy, corrosion-resistant, heat-resistant steels permit the latter to be forged and rolled commercially, leads to the speculation on whether the nodular or spheroidal type cast irons produced by additions of cerium or magnesium would be easier to roll than regular gray iron. Early work on rolling of cast iron was done in 1932 by Nipper in Germany, and investigated further in 1947 by Piwowarski and Wittmoser.

♦ ♦ ♦

MODIFICATION of a regular Izod impact testing machine so that it would accommodate a much larger specimen was described by J. T. Eash and A. P. Gagnebin, International Nickel Co., New York, at the recent annual meeting of American Society for Testing Materials. Changes involved a shorter pendulum shaft, different hammer, and different grip arrangement to handle the standard 1.2-in.-diam arbitration test bar for cast iron. Machine accommodates irons with impact values from 10 to 120 ft lb. According to the authors, the test reflects changes in structure resulting from presence of brittle networks, form and quantity of graphite and changes in matrix structure. Test also is sensitive to metallurgical quality of surface zones which is particularly useful since most castings are employed in the unmachined state.

♦ ♦ ♦

ACCORDING to Dr. K. F. Hager and Morris Rosenthal in March-April issue of *Ordnance,* iodine in 0.10 per cent concentration in sulphuric, hydrochloric or other pickling acids for ferrous materials acts as successful inhibitor in preventing the attack of the acid on metal when removing rust or oxide. After the rust is removed, the parts are rinsed in water and oiled to give temporary protection against rerusting. The authors also state that water-soluble cutting oils are 80 per cent effective acid pickling inhibitors when used in 0.20 per cent volume concentrations with sulphuric acid. They also provide a rust-resisting film over the freshly pickled surface.

♦ ♦ ♦

LARGE increase of speed of welding in the shielded-inert gas, metal arc process is claimed for a new principle developed by Linde Air Products Co., Union Carbide & Carbon Corp. Procedure involves addition of small amounts of oxygen to the argon gas employed as the shield. It is claimed that the oxy-argon mixture permits welding at lower current densities, welding at higher speeds without undercutting, and greatly increased droplet rate with no change in current density.

♦ ♦ ♦

ARMY ORDNANCE Corps recently announced discovery of a new finish for magnesium and its alloys which has excellent corrosion resistance, high melting point, good dielectric strength and hardness. Known as HAE after its discoverer H. A. Evangelides, Frankford Arsenal, the finish is applied electrolytically and gives a brown color of varying shades which is an excellent paint base. At present the finish is available only for military applications, and information relative to it may be obtained from Office, Chief of Ordnance, Washington 25, Attention ORDTB—Materials.

♦ ♦ ♦

STUDY of 81 aluminum alloys in the D.T.D 424 specification range by Scheuer, Williams and Wood, reported in the *Journal* of the Institute of Metals (Great Britain) led to the development of contour graphs to indicate the ranges of Cu, Si, and Mg to meet an ultimate tensile strength of 9 tons (20,000 lb) per sq in. and 2 per cent elongation. Composition range of the D.T.D 424 alloy is given as 2 to 4 per cent Cu, 0.15 per cent max Mg, 3 to 6 per cent Si, 0.8 per cent max Fe, 0.3 to 0.7 per cent Mn, 0.35 per cent max Ni, 0.3 per cent max Zn, 0.05 per cent max Pb, 0.04 per cent max Sn, and 0.2 per cent max Ti.

♦ ♦ ♦

ALLOY steel developed by American Foundry & Machine Co., Salt Lake City, in co-operation with Climax Molybdenum Co. and Battelle Memorial Institute, is reported to give excellent service in liners for ore grinding mills. Melted in acid electric furnaces the steel contains 1.0 per cent C, 0.9 per cent Mn, 1.5 per cent Cr, 0.5 per cent Mo. Castings are homogenized at 2000°F for 6 hr and quenched in a salt bath at 700°F where they are held for 5 hr. Then the castings are tempered at 1150°F for 4 hr.

♦ ♦ ♦

APPLICATION of the mass spectrometer to quantitative analysis of metals by a simple practical technique now is possible. Developed by J. G. Gorman, E. J. Jones and J. A. Hipple of the National Bureau of Standards, the new procedure is said to yield highly accurate, easily interpreted results with greater speed and convenience than chemical analysis. In the mass spectrometer materials to be analyzed are first converted to positive ions. They then are passed through crossed electrostatic and magnetic fields where they are deflected by varying amounts depending upon their mass and charge. Intensities of the separated ion beams are detected either photographically or electrically, and are used to determine the quantity. Present method involves measurement of total and partial ion currents.

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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	713,330	371,214	.....
1950			
Feb.	60,386	31,249	67,049
2 mo.	123,260	64,167	.....
Mar.	66,259	38,639	69,866
Apr.	69,822	36,279	76,250
May	76,161	42,432	77,074
June	82,345	46,613	86,783
July	67,514	37,198	105,300
Aug.	86,021	50,019	132,374
Sept.	82,479	46,927	152,583
Oct.	89,968	50,157	160,278
Nov.	85,163	48,670	180,099
Dec.	91,510	51,091	194,950
Total	920,502	512,492	.....
1951			
Jan.	92,508	54,817	234,060
Feb.	88,950	54,915	255,347
2 mo.	181,458	109,732	.....

Copper-base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled Orders[2]
1949	724,053	654,444	37,311	.....
1950				
Apr.	72,318	64,773	3,848	28,769
4 mo.	284,495	255,406	15,607	.....
May	79,108	71,605	3,751	30,880
June	83,023	74,990	3,896	32,808
July	69,033	62,414	3,789	39,906
Aug.	94,013	85,948	4,258	52,513
Sept.	95,641	87,111	4,630	58,673
Oct.	105,746	96,911	5,064	66,560
Nov.	103,694	93,607	5,776	67,931
Dec.	100,548	90,513	5,985	69,569
Total	1,016,180	918,883	52,756	.....
1951				
Jan.	102,643	92,171	6,363	77,580
Feb.	96,946	87,667	5,427	75,967
Mar.	110,887	100,221	6,405	79,766
Apr.	101,506	91,852	5,802	82,711
4 mo.	411,982	371,911	23,997	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Shipments—Die	Unfilled Orders[2]
1949	304,409	106,825	102,908	87,812	.....
1950					
Apr.	33,356	11,091	10,656	10,795	49,952
4 mo.	126,822	43,944	40,508	39,500	.....
May	36,031	11,526	11,928	11,799	52,580
June	37,600	12,677	11,825	12,173	53,309
July	30,152	9,613	9,808	9,943	63,892
Aug.	39,852	14,117	12,682	12,207	82,564
Sept.	42,061	14,369	13,085	13,594	89,723
Oct.	47,278	15,994	14,893	15,408	102,938
Nov.	46,816	16,099	14,040	15,715	67,931
Dec.	45,999	15,675	15,052	14,322	104,380
Total	452,610	154,013	143,821	144,661	.....
1951					
Jan.	42,538	14,401	14,554	12,641	93,264
Feb.	40,785	14,106	13,082	12,852	94,581
Mar.	42,204	15,900	12,771	12,677	100,453
Apr.	40,242	14,455	12,901	12,079	106,077
4 mo.	165,769	58,862	53,308	50,249	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	9,364	8,781	....
1950			
Apr.	799	751	2,305
4 mo.	3,251	3,038	....
May	810	762	2,282
June	758	698	2,482
July	727	677	3,356
Aug.	1,147	1,078	4,855
Sept.	1,231	1,154	4,942
Oct.	1,354	1,297	5,573
Nov.	1,508	1,434	6,928
Dec.	1,528	1,444	6,958
Total	12,314	11,582	....
1951			
Jan.	1,840	1,739	8,616
Feb.	1,907	1,801	10,878
Mar.	2,156	2,058	12,196
Apr.	2,267	2,161	12,191
4 mo.	8,170	7,759	....

Foundry Production Workers

Estimated Number

	Mar. 1951	Feb. 1951	Mar. 1950
Gray Iron	163,000	162,400	127,000
Malleable	27,600	27,100	21,400
Steel	59,400	57,100	36,800
Nonferrous	93,100	93,700	69,800

Average Weekly Earnings

	Mar. 1951	Feb. 1951	Mar. 1950
Gray Iron	$72.22	$69.98	$59.85
Malleable Iron	73.57	71.01	61.50
Steel	72.95	73.96	60.72
Nonferrous	72.74	72.15	63.47

Average Weekly Hours

	Mar. 1951	Feb. 1951	Mar. 1950
Gray Iron	43.4	42.8	40.3
Malleable Iron	43.2	42.6	39.5
Steel	42.0	42.8	39.1
Nonferrous	41.9	41.8	40.4

Labor Turnover Rate (Mar.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	6.3	5.3	3.7	0.4
Malleable Iron	6.5	5.9	4.0	0.1
Steel	7.0	5.6	3.8	0.7
Nonferrous	5.3	6.0	3.2	1.4

Source: Bureau of Labor Statistics.

Gray Iron Castings—Shipments

(Net tons[1])

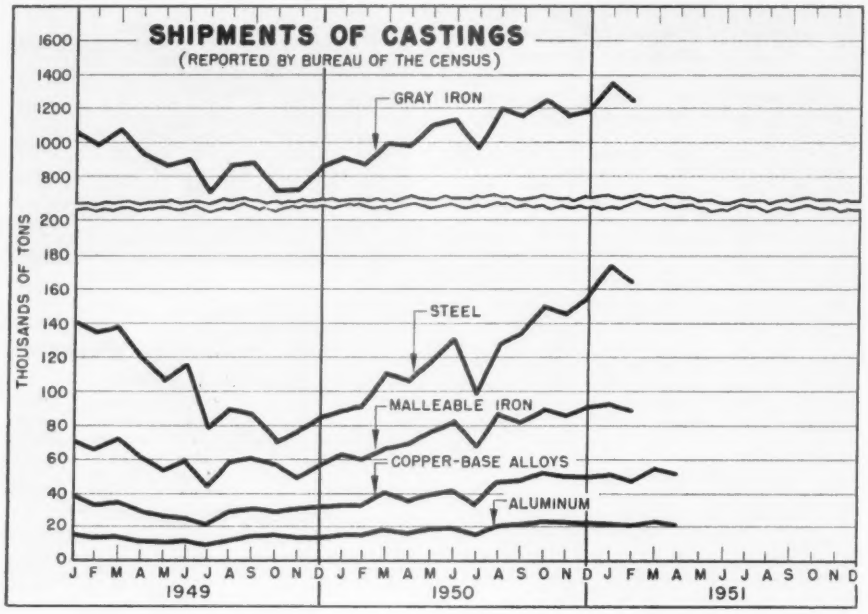
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Chilled Railroad Car Wheels—For Sale	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3] Total
1949	10,549,284	5,521,441	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
Feb.	864,189	416,594	551,060	201,468	169,605	75,832	33,417	29,187	63,363	46,744	873,455
2 mo.	1,777,510	866,171	1,124,803	416,220	357,757	164,076	67,671	58,596	127,458	99,821	.....
Mar.	995,782	500,195	635,403	244,122	170,082	71,317	44,898	39,357	89,264	56,135	921,575
Apr.	981,126	483,862	621,368	233,397	182,420	77,923	42,768	37,972	82,774	51,796	922,255
May	1,095,111	572,887	684,632	277,447	195,021	86,016	46,219	40,185	104,529	64,710	977,833
June	1,136,129	613,084	713,811	300,863	197,474	91,377	45,672	41,672	106,980	72,192	1,039,618
July	961,450	507,867	595,918	241,632	177,154	82,363	35,066	30,560	94,438	58,874	1,286,579
Aug.	1,201,569	677,134	747,046	335,868	199,770	92,340	52,508	46,681	131,127	71,118	1,670,380
Sept.	1,159,240	648,966	722,667	325,019	203,191	94,968	44,707	40,304	121,556	67,119	1,794,118
Oct.	1,254,901	700,512	792,764	364,607	220,821	100,082	46,516	41,023	119,105	75,695	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
Dec.	1,181,974	652,929	745,766	333,033	210,700	98,071	43,667	39,984	111,066	70,775	2,012,480
Total	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....
1951											
Jan.	1,364,311	762,407	875,437	405,863	228,824	103,475	56,046	49,065	131,779	72,225	2,297,705
Feb.	1,234,226	684,928	811,724	369,932	193,648	91,598	49,423	43,967	117,141	62,290	2,391,843
2 mo.	2,598,537	1,447,335	1,687,161	775,795	422,472	195,073	105,469	93,032	816,720	135,515	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties[3]	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties[3]	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties[3]	Unfilled Orders[3] Total
1949	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
Feb.	91,827	62,045	10,920	66,843	44,473	9,589	24,984	17,572	1,331	165,186
2 mo.	180,648	120,041	20,218	131,459	86,032	18,196	49,189	34,009	2,022	.....
Mar.	111,772	77,588	15,281	82,458	56,492	14,012	29,314	21,096	1,269	185,611
Apr.	106,964	75,133	17,406	79,912	56,008	16,124	27,052	19,125	1,282	201,643
May	117,944	83,845	20,552	88,202	63,658	18,811	29,742	20,187	1,741	198,078
June	131,097	94,637	27,065	96,365	72,427	24,653	34,732	22,210	2,412	206,799
July	98,269	68,874	15,734	70,122	51,204	14,577	28,147	17,670	1,157	255,418
Aug.	128,369	94,413	24,922	92,197	70,721	22,952	36,172	23,692	1,970	329,944
Sept.	134,574	96,738	25,295	98,523	74,052	23,992	36,051	22,686	1,303	427,969
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
Dec.	155,258	113,692	34,061	118,744	88,552	32,160	36,514	25,140	1,901	554,187
Total	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....
1951										
Jan.	174,056	124,002	41,586	135,086	98,197	37,278	38,970	25,805	4,308	675,385
Feb.	163,976	117,156	41,754	126,293	93,461	36,189	37,683	23,695	5,565	706,989
2 mo.	337,032	241,158	83,340	261,379	191,658	73,467	76,653	49,500	9,873	.....

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1950	1951
Jan.	159.3	668.0
Feb.	113.1	638.6
Mar.	225.2	599.0
Apr.	160.6	490.1
May	294.9	431.7
June	622.7	....
July	401.8	....
Aug.	693.6	....
Sept.	483.8	....
Oct.	526.8	....
Nov.	885.5	....
Dec.	526.2	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1949	63,637,429	63,462,233	2,778,868
1950			
Apr.	6,156,294	6,005,632	277,673
4 mo.	20,913,094	21,998,672	974,521
May	6,397,032	6,385,493	294,334
June	6,238,067	6,255,094	276,555
July	6,368,489	6,265,821	267,142
Aug.	6,417,404	6,420,483	278,306
Sept.	6,263,214	6,243,584	274,657
Oct.	6,649,935	6,543,428	332,444
Nov.	6,243,970	6,131,733	317,120
Dec.	6,606,464	6,590,823	322,458
Total	72,097,669	72,735,131	3,337,517
1951			
Jan.	6,791,828	6,766,767	330,698
Feb.	6,001,538	6,036,774	293,169
Mar.	6,692,460	6,693,661	299,190
Apr.	6,485,660	6,355,177	357,558
4 mo.	25,971,486	25,852,379	1,280,615

Ingot Brass and Bronze

(Shipments in net tons)

	1950	1951
Jan.	18,874	28,416
Feb.	18,487	27,168
Mar.	22,494	31,997
Apr.	22,118	30,472
May	23,643	33,267
June	25,098	.....
July	21,609	.....
Aug.	29,689	.....
Sept.	28,811	.....
Total for year	303,563	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	377,779	248,679	.....
1950			
Nov.	48,852	32,844	102,524
Dec.	47,818	31,161	102,636
Total	536,398	341,833	.....
1951			
Jan.	41,186	27,646	90,596
Feb.	38,964	25,307	93,606
Mar.	44,218	27,959	100,652
Apr.	43,513	28,565	101,949
4 mo.	167,861	109,477	.....

Iron and Steel Scrap Consumption

(Thousands of gross tons*)

	All Scrap—Total	All Scrap—Purchased	By Type of Furnace: Cupola—Total	Cupola—Purchased	Air—Total	Air—Purchased	Electric—Total	Electric—Purchased
1949	49,281	22,922	7,968	4,175	801	276	4,239	2,608
1950								
Jan.	4,906	2,267	699	337	71	25	433	259
Feb.	4,539	2,149	670	315	71	27	417	253
Mar.	5,101	2,430	778	372	87	31	497	296
Apr.	5,119	2,451	766	365	79	29	493	300
May	5,333	2,552	897	416	85	32	539	324
June	5,122	2,483	864	427	92	33	533	317
July	4,708	2,244	669	318	70	28	490	295
Aug.	5,202	2,464	862	426	106	39	568	327
Sept.	5,170	2,468	819	404	109	40	579	348
Oct.	5,643	2,707	886	437	108	40	643	384
Nov.	5,293	2,598	841	481	107	39	593	364
Dec.	5,361	2,600	803	418	122	44	600	361
12 Mo.	61,497	29,403	9,474	4,666	1,118	407	6,385	3,828
1951								
Jan.	5,975	3,010	1,009	534	110	41	684	436

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons): Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons): Total	Cupola	Air	Electric
1949	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
May	5,773.6	257.7	223.5	4,572.3	720.1	5,203	474	24	13
5 mo.	25,152.3	1,139.7	1,068.1	19,698.0	3,246.5	23,033	2,188	110	122
June	5,549.3	209.5	257.7	4,393.8	688.3	5,083	494	25	13
July	5,804.2	269.3	282.2	4,561.2	691.5	5,018	403	23	14
Aug.	5,706.2	257.0	284.0	4,407.3	757.9	5,136	516	30	18
Sept.	5,614.6	244.0	257.2	4,380.9	732.5	5,092	500	26	17
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
Nov.	5,316.5	277.1	279.1	4,093.7	666.6	4,817	462	30	14
Dec.	5,609.2	264.9	260.2	4,374.4	709.8	5,068	456	34	15
12 Mo.	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Jan.	5,801.7	300.0	233.3	4,529.8	738.6	5,367	542	32	11
Feb.	5,084.8	238.7	226.0	4,007.2	612.9	.....	.....	.....	.....
Mar.	5,919.3	267.9	276.5	4,647.5	727.5	.....	.....	.....	.....
Apr.	5,812.2	259.1	261.0	4,575.8	716.1	.....	.....	.....	.....
May	6,104.9	282.0	259.4	4,777.0	786.5	.....	.....	.....	.....
5 mo.	28,721.9	1,347.7	1,256.2	22,536.8	3,581.6	.....	.....	.....	.....

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.

MONEY SAVING TOOLS

Layouts, drawings, specifications, bills of material. These documents, prepared by Giffels & Vallet, Inc., represent condensed experience gained in engineering foundry projects for more than twenty years. They are the plan of attack for building toward lower production costs. They are the tools used to acquire competitive prices on equipment, materials, and construction labor. They represent design in which the engineering has been integrated so that delays and costly field changes are eliminated. These tools are available to you for the development of your plans for new foundries or for expansion and modernization programs.

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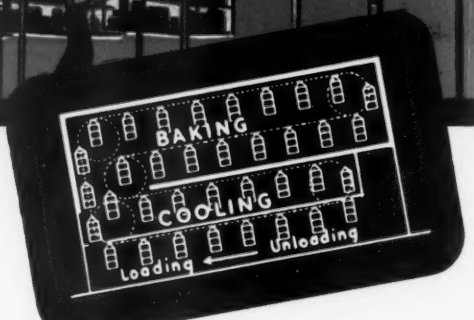
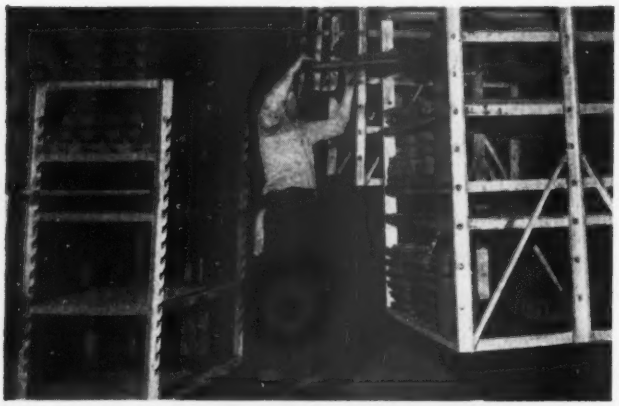
INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING, DETROIT

GET MORE WORKING SPACE FROM PRESENT PLANT

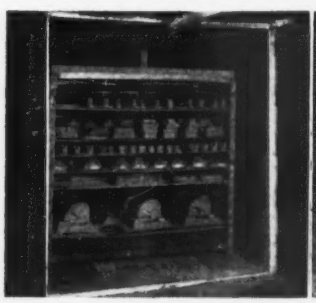
DESPATCH
ELEVATED CONTINUOUS CONVEYOR CORE BAKING OVEN

DESPATCH combination gas-oil fired oven, 13 ft. wide, 27 ft. high, 52 ft. long. Has variable speed continuous conveyor. Cores make horizontal passes thru bake chamber, (see diagram) then enter fan-equipped cooling section.





DESPATCH conveyor ovens help boost core output-per-man as loading and handling are greatly simplified. Foundrymen appreciate the labor-saving features of DESPATCH Conveyorized Ovens.



Intermittent monorail conveyor DESPATCH oven with swing doors at both ends.

DESPATCH core and mold oven with heavy duty, electrically operated lift door.

This ingeniously designed DESPATCH oven gave foundrymen more working space from their present plant and increased core baking output at the same time. It provides ample baking capacity up to 84 tons per day and gives the foundry much needed floorspace. The oven is built to carry 38 long (7½′ x 2′ x 3′) core racks suspended from a continuous conveyor chain.

DO THESE ADVANTAGES INTEREST YOU?

1. SAVES FLOORSPACE: Platform-mounted heater, fans, controls, plus compact overall design, allow more work space on foundry floor.

2. ALLOWS FAST, EASY HANDLING: Built-in cooling section provides fast, uniform cooling. Eliminates fumes. Provides speedy unloading and reloading without delay.

3. STRAIGHTENS COREMAKING LINES: Unique design permits single open loading—unloading area, easily reached from all sides. Accommodates wide range of core sizes.

4. REDUCES BAKING COSTS: Efficient system recirculates up to 75% of heated air. Guarantees fast, even, low-cost baking.

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DESPATCH OVEN COMPANY

DETERMINING SPOUT ANALYSIS FROM RAW MATERIALS CHARGED IN THE CUPOLA

Calculating the tentative composition of cupola iron from the raw materials charged is not too difficult, and once the basic idea is understood, the work is comparatively simple.

While essential information is presented in the Handbook of Cupola Operation, the various steps involved are not given in detail, and for the benefit of those unfamiliar with the procedure, the following is presented.

First, one must know the compositions of the various raw materials to be used such as pig iron, various types of cast iron and steel scrap, ferroalloys, etc. Data on average compositions of commonly used gray iron foundry scrap materials are given in the accompanying table. From that information the actual weight in pounds of any of the various elements such as silicon, manganese, etc., can be determined for each type of raw material. The sum of those weights divided by the total weight of the charge gives the percentage of the element in the iron at the spout. Since melting in the cupola results in the loss of a small amount of some elements and an increase in others, those values have to be subtracted from or added to the previously determined percentage figure to provide the final figure to be used.

While the foregoing description may seem quite involved and complicated, its reduction to practicality will reveal that it is otherwise. For that purpose it will be advisable to make up what is termed the "mixture sheet" shown on the following page. Assume that the raw materials with their compositions are as indicated on this sheet in the per cent columns of the various elements —silicon, manganese, etc. Also assume that the tentative selection of the raw materials is as shown in the per cent of charge and by weight.

Next step is to determine the actual weight of each element for each type of material, and that is obtained by multiplying the percentage by the weight. In other words 300 lb pig iron containing 2 per cent silicon contains 6 lb of that element, and the figure is entered in the column marked Lb under Silicon. That operation is carried out for each element and for all the materials. Then the figures in the Lb columns are totaled, and divided by the weight of the charge which in this case happens to be 2000 lb. Those values in per cent give the analysis as charged. However, as previously mentioned, the cupola melting operation results in a gain in some elements such as carbon and sulphur and a loss in others such as silicon manganese. Phosphorus remains about the same.

Generally the silicon loss is figured at 10 per cent and the manganese as 20 per cent. Gain in sulphur and carbon will depend largely on the coke and the amounts used in the splits, and will vary for different cupolas, but may be assumed at values indicated on the sheet until they have been ascertained from cupola operation for a period of time.

The losses and gains then are subtracted from or added to the analysis as charged to provide the estimated analysis of the iron over the spout. By checking losses and gains for the various elements for your cupolas, you can obtain values for those which will make the final estimated analysis come reasonably close to the analysis obtained by chemical determination.

It should be pointed out that until some experience is gained that the first few "guesstimates" may be considerably off in some elements to meet a contemplated analysis. In those cases the quantities are changed and others substituted to bring them into line—recalculating as the changes are made.

Average Composition of Various Types of Scrap

Type	Si	Mn	P	S	TC	Cr	Ni	Mo	Cu
No. 1 Machinery Cast No. 1 Cast	2.10	0.60	0.50	0.10	3.25	0.05	0.05	...	...
Automotive Cast	2.25	0.75	0.20	0.12	3.30	0.05	0.10	0.20	0.5
No. 2 Auto Steel	0.10	0.70	0.03	0.03	0.30	0.15	0.20	Tr.	Tr.
R. R. Car Wheels	0.55	0.55	0.30	0.13	3.50	...	...	...	...
Agricultural Scrap	2.25	0.60	0.30	0.12	3.40	Tr.	Tr.	...	...
No. 1 R. R. Cast	2.15	0.60	0.40	0.10	3.30	...	...	...	...
No. 2 R. R .Cast	1.90	0.60	0.35	0.10	3.20	...	...	...	...
No. 3 R. R. Cast	1.25	0.70	0.30	0.10	3.10	...	...	...	...
Brake Shoes	1.15	0.55	0.35	0.10	3.20	...	...	...	...
No. 1 Radiator No. 2 Radiator	2.30	0.55	0.55	0.10	3.45	...	...	...	...
Mill Scrap	2.30	0.55	0.80	0.10	3.45	...	...	...	...
No. 1 Malleable No. 2 Malleable	0.95	0.40	0.15	0.10	2.30	...	...	...	...
R. R. Malleable Agricultural Malleable									
Rails	0.25	0.80	0.05	0.05	0.60	...	...	...	..

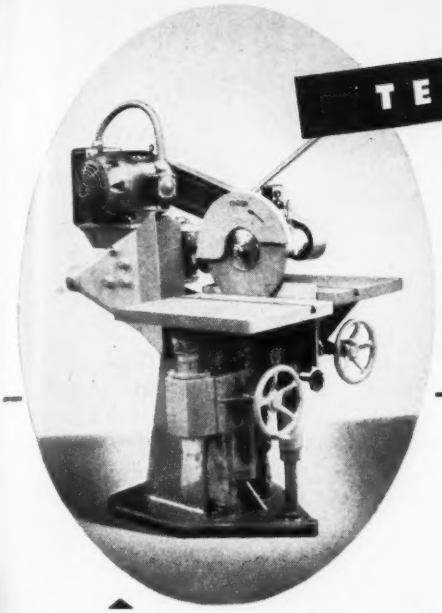
CUPOLA MIXTURE SHEET

MIXTURE NO. 21 CUPOLA NO. 1 HEAT NO. 3 DATE 4/25/51

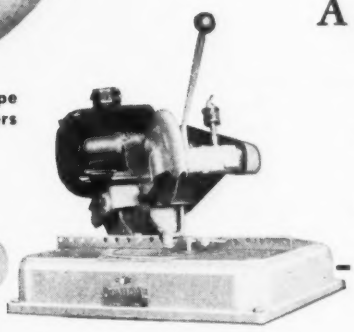
MATERIAL CHARGED	PER CENT	POUNDS PER CHARGE	SILICON %	SILICON LB	MANGANESE %	MANGANESE LB	SULPHUR %	SULPHUR LB	PHOSPHORUS %	PHOSPHORUS LB	CARBON %	CARBON LB	REMARKS
Pig Iron Car 649874	15	300	2.00	6.0	0.80	2.4	0.050	0.15	0.40	1.2	3.60	10.8	
Pig Iron Car 892754	15	300	2.30	6.9	0.60	1.8	0.050	0.15	0.60	1.8	3.40	10.2	
Stoveplate	10	200	2.50	5.0	0.70	1.4	0.110	0.22	0.80	1.6	3.30	6.6	
No. 1 Cast	25	500	2.10	10.5	0.60	3.0	0.120	0.60	0.50	2.5	3.25	16.3	
Steel Scrap	10	200	0.25	0.5	0.75	1.5	0.050	0.10	0.05	0.10	0.50	1.0	
Remelt	25	500	2.50	12.5	0.70	3.5	0.110	0.55	0.60	3.0	3.45	17.3	
Ferrosilicon		8 Briquets		8.0									
TOTAL	100	2000		49.4		13.6		1.77		10.2		62.2	
ANALYSIS CHARGED (TOTAL÷WEIGHT)				2.47		0.68		0.089		0.51		3.11	
MELTING LOSS OR GAIN				-.25		-.14		+04		NO CHANGE		+.30	
ESTIMATED ANALYSIS				2.22		0.54		0.129		0.51		3.41	

TEST YOUR

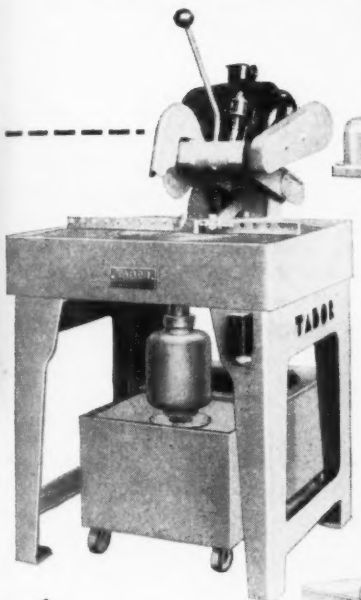
Industrial Quotient!



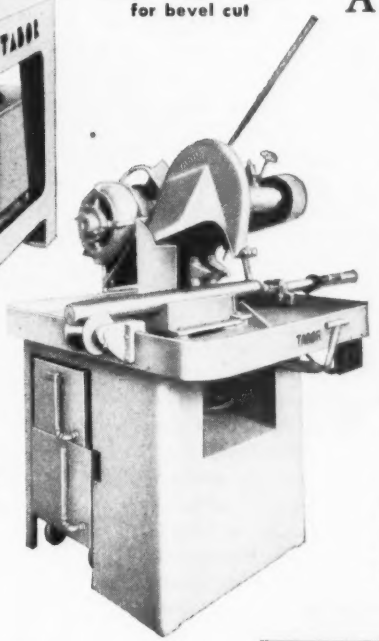
10 H.P. split-table type cutoff for gates and risers



3 H.P. bench-type cutoff for bar stock and shapes—set for bevel cut



3 H.P. floor-type cutoff for bar stock and shapes—equipped for bevel wet cutting



10 H.P. cutoff for bar stock and shapes—with coolant reconditioning tanks

Q WHAT DOES EVERY FOUNDRYMAN KNOW?

A Tabor's line of Abrasive Cutoff machines for the foundry floor—machines that will cut gates and risers from castings of even the toughest metals in a matter of seconds—clean, close-to-the-casting cuts with few or no snags or burrs—a line of cutoffs that ranges from small "standards" to giant "universals."

Q WHAT SHOULD EVERY FOUNDRYMAN KNOW?

A That Tabor's Cutoff machine "family" has grown to include units for cutting bar stock and shapes—a point of special importance to management of captive shops and foundries with their own machine shop operation.

There's a size and type to meet every need. Capacities range from 3 to 15 H.P. There are bench-mount types and floor types. They can be furnished for wet or dry cutting—bevel or right angle.

The "heart" of these machines—the spindle—bears the same stamp of excellence for which our foundry units are famous. Timken Bearing-mounted, specially constructed, the spindle assures cool running and reduces end-play adjustment to an all-time low.

It'll pay you to get full details on these tough, precise, "production-minded" newcomers. We've prepared new bulletins. They're yours for the asking—so write today.

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THEY'RE CUT OUT...TO CUTOFF!

ASTM DRAWS RECORD ATTENDANCE

To Annual Meeting in Atlantic City

By FRANK G. STEINEBACH
and EDWIN BREMER
FOUNDRY

FIFTY-FOURTH annual meeting of the American Society for Testing Materials, held at Atlantic City, N. J., June 18-21, drew a record attendance of 2275 industrial representatives. During the week, 615 committee meetings were held to consider various phases of material specifications.

T. S. Fuller, engineer in charge of Works Laboratory, General Electric Co., Schenectady, N. Y., was elected president for the coming year and L. C. Beard, assistant director, Socony-Vacuum Laboratories, Socony Vacuum Oil Co., New York, was named vice president. John W. Bolton, director of metallurgical research and testing, Lunkenheimer Co., Cincinnati, was one of five men elected to the board of directors of the society.

Presentation of honorary memberships, awards of merit, and recognition of 40-year members featured the annual luncheon. The foundry industry was especially interested in the presentation of an award of merit to Hyman Bornstein, chief technical consultant, Deere & Co., Moline, Ill., for his many contributions to the work of the society, especially in the field of ferrous metals.

Report of Committee B-5 on Copper and Copper Alloys, Cast and Wrought, was presented at the nonferrous metals session by G. R. Gohn, Bell Telephone Laboratories, New York. The report indicated that Subcommittee F-1, on Castings and Ingots for Remelting, has recommended revisions for immediate adoption in three standard specification: B 22, B 61 and B 62. A task group, headed by John Bolton, has prepared the complete revisions of Specifications B 61 and B 62 to cover component castings of valves, flanges and fittings.

Among the subjects under consideration in the subcommittee are the preparation of a document similar to British Standard 1367: 1947, "Code of Procedure in Inspection of Copper-Base Alloy Sand Castings," the preparation of specifications for a group of copper-nickel-tin-zinc alloys, and preparation of specifications for centrifugal castings. The subcommittee also is reviewing the Tentative Recommended Practice for Tension Test Specimens for Copper-Base Alloys for Sand Castings, B 208, to determine if it should be recommended for standard.

The opening session related to methods of testing, and J. R. Townsend, Bell Telephone Laboratories, New York, presided. A number of committee reports were presented, including those on non-destructive testing, malleable iron castings, and methods of testing. In report of Committee E-7 on Non-destructive Testing, J. H. Bly, chairman, pointed out that Tentative Industrial Radiographic Terminology for Use in Radiographic Inspection of Castings and Weldments (E 52-49T) and Tentative Industrial Radiographic Standards for Steel Castings (E 71-47T) were to be continued for one more year without revision.

W. A. Kennedy, chairman, in reporting for Committee A-7 on Malleable Iron Castings, stated that it is continuing its project of working out an arrangement with the National Bureau of Standards relative to adding a white iron sample to the latter's list of standard samples. As a result of further study of the Tentative Specification for Malleable Iron Flanges, Pipe Fittings and Valve Parts (A 277-44T) it has been decided to substitute a new tentative with the title "Malleable Iron Flanges, Pipe Fittings and Valve Parts for Railroad, Marine and Heavy Service Duty" which will be submitted to the Administrative Committee on Standards of the society for action.

Report of Committee E-1 on Methods of Testing presented by J. R. Townsend, chairman, included a revision of Tentative Methods of Compression Testing of Metallic Materials in Other Than Sheet Form (E 9-T), and a revision and reversion to tentative status of Standards Methods of Tension Testing of Metalic Materials (8-T).

In a paper, "An Arbitration Bar Izod Impact Test for Cast Iron," by J. T. Eash and A. P. Gagnebin, International Nickel Co., New York, the authors described a modification of a regular Izod impact machine so that it would handle the standard 1.2-in. diam arbitration bar for determination of impact values from 10 to 120 ft lb. According to the authors, the test readily reflects changes in structure such as presence of brittle networks, the form and quantity of graphite, and changes in the matrix structure. It also is sensitive to the metallurgical quality of the surface zones which is particularly useful since most castings are used in the unmachined condition.

Nathaniel Knowles, deputy administrator, Defense Production Administration, Washington, spoke on "Balancing the Economy for Defense Production" at one session. President L. J. Markwardt was chairman of the meeting. Mr. Knowles discussed the role of DPA in co-ordinating industrial production and described operation of the Controlled Materials Plan.

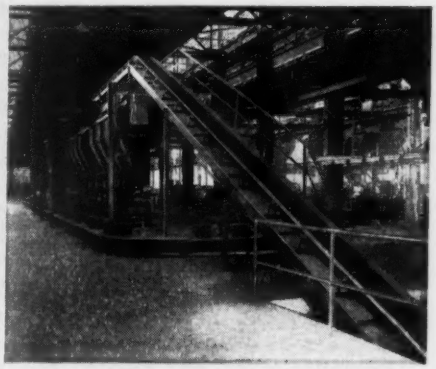
Mr. Knowles said that no unnecessary surpluses of critical materials are being held in reserve, but stockpiling will continue until sufficient such vital materials are available to maintain production for a reasonable length of time in event the country

(*Concluded on page* 166)

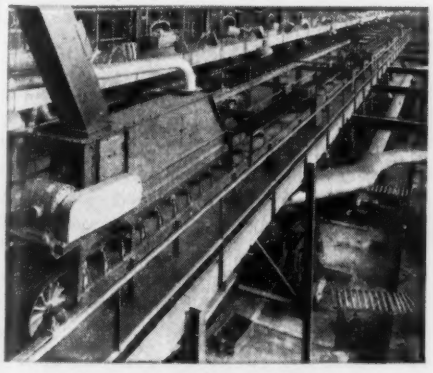
HYMAN BORNSTEIN
. . *merit award winner*

JOHN W. BOLTON
. . . *new director*

Above: Sand Plant in Large Gray Iron Foundry Showing Storage Bins, Weigh Hopper and Mill.



Belt Distributor Carrying Conditioned Sand to Molders' Hoppers.



Aerator on Distributing Belt in Large Mid-Western Foundry.

Sand Handling

cuts casting costs

● Bartlett-Snow Sand Conditioning systems with overhead return to the molders hoppers, synchronize and coordinate molding, pouring, shaking out and all other operations. Bottlenecks, delays and lost time are minimized. Each workman attains his maximum productive effectiveness, makes more money, becomes a happier employee, and the resulting increased output from the same floor area reduces casting costs, sometimes by as much as 33%.

35 years experience in laying out, detailing, fabricating and erecting complete or partial systems. The C. O. Bartlett & Snow Company, 6201 Harvard Avenue, Cleveland 5, Ohio.

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FABRICATORS

ERECTORS

(*Concluded from page* 164)
is cut off from sources of supply by war.

In an afternoon session under the direction of A. E. White, University of Michigan, Ann Arbor, Mich., several committee reports and papers relating to effect of temperature on metals were presented. In the report of Committee A-1 on Steel, Norman L. Mochel, chairman, stated that revised tentatives recommended by the committee and published in the 1950 supplement to the *Book of Standards* include: Mild-to-medium-strength Carbon-steel Castings for General Application (A 27-46T); High-strength Steel Castings for Structural Purposes (A 148-46T). The revised and reverted to tentative status of standard on Alloy-Steel Castings for Valves, Flanges and Fittings for High Temperature Service (A 157-44) also appears.

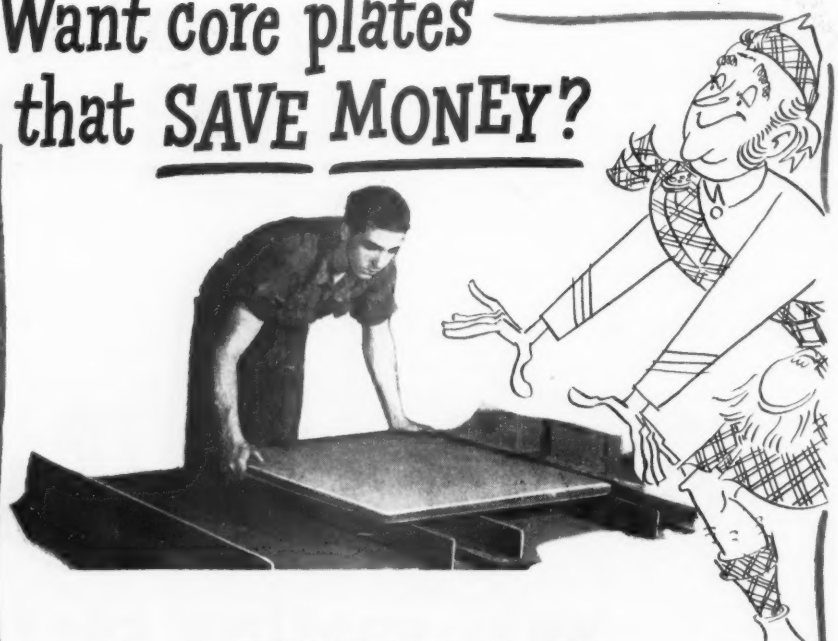
James S. Vanick, chairman, presented the report of Committee A-3 on Cast Iron, and pointed out that specification A 278 on Gray Iron Castings for Pressure-containing Parts for Temperatures up to 650° F has been revised to bring it in accord with the ASME Boiler Code Requirements, and that the committee is developing a proposed specification for nodular iron. Report of Committee A-5 on Corrosion of Iron and Steel was given by T. R. Galloway, chairman, and that of the Joint Committee on Effect of Temperature on the properties of Metals by Robert J. Painter.

Wednesday afternoon F. L. LaQue, International Nickel Co. delivered the twenty-fifth Marburg Lecture, on "Corrosion Testing." Previous to the presentation the Charles B. Dudley medal was awarded to D. S. Clark and P. E. Duwez, California Institute of Technology, Pasadena, Calif., for their paper, "The Influence of Strain Rate on Some Tensile Properties of Steel." The Richard L. Templin award was made to R. L. Templin and W. C. Aber, Aluminum Research Laboratories, New Kensington, Pa., for their paper "A New Method for Making Tension Tests of Metals Using a Miniature Specimen", and the Sam Tour award was given to C. T. Evans Jr., Elliott Co., Jeannette, Pa., for his paper on "Oil Ash Corrosion of Materials at Elevated Temperature." Annual dinner of the society was held Wednesday evening.

Thursday morning's session with Richard L. Templin, Aluminum Research Laboratories, New Kensington, Pa., presiding included the presentation of numerous reports of committees and three papers on aluminum alloys. J. R. Townsend, chairman, gave a brief resume of the report of Committee B-6 on Die-cast Metals and Alloys, and W. Babington, Bell Telephone Laboratories Inc., discussed a paper on "Aluminum Die Castings—The Effect of Process Variables on Their Properties," which was prepared jointly with D. H. Kleppinger, Frankford Arsenal. L. L. Wyman, vice chairman reviewed the report of Committee A-10 on Iron-chromium, Iron-chromium-nickel and Related Alloys.

Other committee reports included those of B-7 on Light Metals and Alloys, Cast and Wrought; E-2 on Emission Spectroscopy; E-3 on Chemical Analysis of Metals; E-4 on Metallography, and E-12 on Appearance. Meeting closed with a resume by Mr. Hull in absence of the authors of three papers on aluminum alloys. These were: "Creep Properties of Two Tempers of 63S Extruded Aluminum Alloy" by O. D. Sherby and J. E. Dorn, University of California; "Effect of Annealing on the Creep Properties of 2S-O Alloy" by the same authors, and "Creep Properties of Some Forged and Cast Aluminum Alloys" by O. D. Sherby, T. E. Tietz and J. E. Dorn, University of California.

Want core plates that SAVE MONEY?



. . . then use TRANSITE CORE PLATES for easy handling, low maintenance, long life!

You get real long term economy with Transite* Core Plates. Their initial cost is low . . . and their maintenance cost negligible. Transite Core Plates are tough and corrosion-resistant. They are made from an asbestos and cement composition by a special Johns-Manville process. They resist shock and corrosion . . . will not crack or break easily.

Here are other important reasons for using Transite Core Plates:

THEY SPEED PRODUCTION— Transite Core Plates are easily handled. They're simple to clean, too, since core wash, sand, etc. do not adhere to them as readily as to other core plate materials.

THEY MAINTAIN ACCURACY— Foundrymen who have used Transite Core Plates for years report minimum warpage.

For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 290, New York 16, New York.

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Made of Asbestos

For Lower Casting Costs
More and More Foundries Are Using

Soffel's
CARBON FREE LIQUIDIZER

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on both ferrous and non-ferrous metals and also in ingot production. It is the original scientific, non-carbon, exothermic compound for feeding heads and risers.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is different from ordinary head compounds in many ways:

(1) It is carbon free and Exothermic
(2) It is an insulator to heat loss
(3) It is lighter in weight than most head compounds

Carbonaceous materials, regardless of their composition, will cause carbon pickup, segregation, non-uniform grain structure, and hard spots under risers and in castings. These materials contribute no added heat value or increased temperatures to the feeding metal and only act as an insulating cover. On the other hand, SOFFEL'S CARBON FREE LIQUIDIZER is entirely free from carbon, sulfur, and phosphorus and will not contaminate a metal or alloy in any way.

When applied on the heads or risers, CARBON FREE LIQUIDIZER reacts within itself *exothermically*, producing a temperature above 3200° F. It actually increases the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. In this manner, shrink cavities in the casting caused by premature freezing of the feeding metal are eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft refractory insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads or risers.

SOFFEL'S NEW THERMOTOMIC HOTOP

A new exothermic carbon free LIQUIDIZER for heads and risers of castings of iron or steel. Does not contain any powdered metal and can be used on any ferrous alloy without danger of contamination. In many foundries riser height reductions of 50 to 70% have been obtained; individual casting yields have been increased as much as 15 to 20%. SOFFEL'S THERMOTOMIC HOTOP will develop well over 4000° F. without affecting the chemical analysis in the heads or castings. It forms a porous insulating slag cover which further delays cooling of the metal in the heads and aids directional solidification. SOFFEL'S THERMOTOMIC HOTOP is different than any other head compound on the present market. Order a trial sample which is guaranteed to produce a reduction of riser heads.

Beware of Imitations:

We are the originators of Exothermic Carbon Free Liquidizer

PITTSBURGH METALS PURIFYING COMPANY

Manufacturers of Quality Fluxes and Purifiers for All Metals and Alloys

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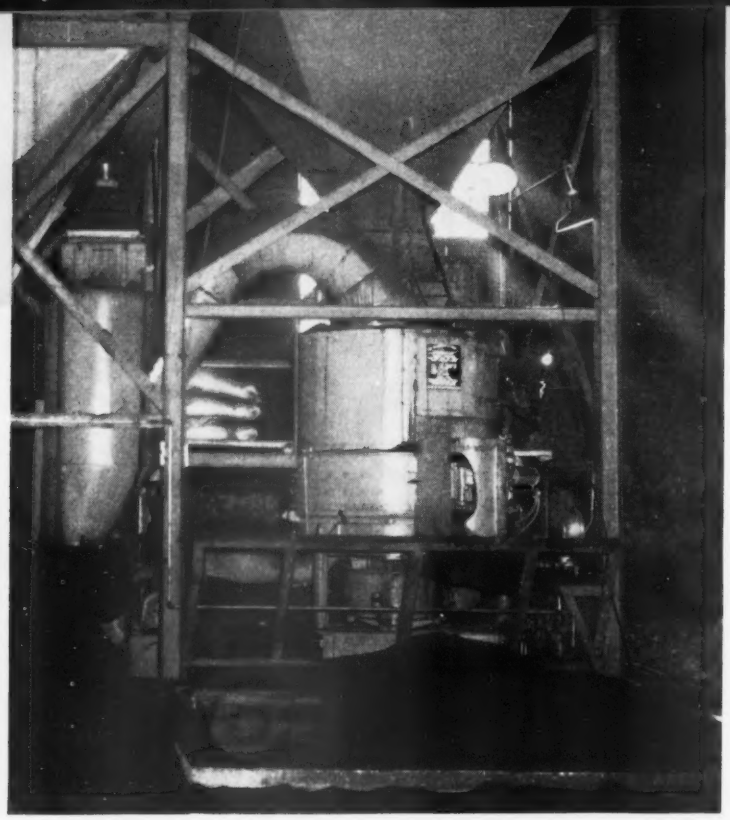

SPEEDMULLORS are doing two important jobs at Canada Iron. The Model "60" Speedmullor, at left, thoroughly mulls molding sand for jobbing operations. Complete mulling requires only 90 to 100 seconds, and the mulled sand is discharged directly into the Sandslinger's portable tanks for use on the slinger. Another Speedmullor at Canada Iron, a Model "50" with cooling and Mulltrolmatic cycle controls, provides fully mulled molding sand to a mechanized production line producing brake shoes and other small castings. The Speedmullor on this line has helped boost production from ten to forty tons per day.

SPEEDMULLORS SANDSLINGERS MULBARO } BOOST

MULBARO prepared sand is used in the important bell cores in casting all sizes of cast iron pipe. The Mulbaro has saved thirty percent of the expensive bonding additions formerly required due to the more thorough mulling job it does.

* A story of results at the Three Rivers, Quebec, plant of Canada Iron Foundries, Ltd.

ST PRODUCTION AT CANADA IRON*

SANDSLINGERS at Canada Iron have given a real boost to jobbing operations. A Motive Sandslinger rams medium and large molds in a fraction of the time formerly required. There has been a twenty percent increase in production with fewer men on the floor. A stationary slinger rams large cores on a roller conveyor unit.

B&P

FEMA

Read Canada Iron's story in Better Methods. A copy is available. Send for more information on Speedmullors, Sandslingers, and Mulbaros. Write today!

BEARDSLEY & PIPER

DIVISION OF PETTIBONE MULLIKEN CORP.

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Manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmullor • Mulbaro • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Combination Sand Conditioning and Mulling Unit • B&P Champion Speed-Draw • B&P Plate Feeder • B&P Turntable • B&P Gyratory Screen • B&P Roller Riddle.

Want mulled sand ANYWHERE in the foundry?

Real portability . . only the sand need be moved—not the entire mullor!

Today's answer is the portable MULBARO

Here's how to have mulled sand readily available in *any* location in the foundry. Use a Mulbaro . . *today's answer* to small foundries for *all* their mulling . . . to large foundries for mulling special batches of facing and core sand and for mixing ladle lining and cupola patching material.

The Mulbaro mulls *thoroughly!* It requires *less* sand handling! It provides real portability at lowest cost.

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OBITUARY

Cecil E. Bales, president, Ironton Fire Brick Co., Ironton, O., died May 26. Mr. Bales joined the company as production manager in 1926, became vice president three years later and president in 1950. He was active in the refractories industry for over 30 years and served on refractories advisory committees for American Foundrymen's Society, American Society for Testing Materials and American Refractories Institute.

* * *

Edward G. Borgnis, 81, until his retirement 14 years ago, sales engineer, International Molding Machine Co., LaGrange, Ill., died June 23 in Wauwatosa, Wis. Mr. Borgnis became a patternmaker apprentice at 18, with Weisel & Vilter Mfg. Co., Milwaukee, later working for Harnishfeger Corp., Filer & Stowell Co., and Falk Corp., there. In 1940 he was honored by the Wisconsin Chapter of the AFS for serving the foundry industry 50 years.

* * *

Julius Judell, 69, founder and president, Milwaukee Flush Valve Co., Milwaukee, died there June 15. Mr. Judell founded the company in 1912 to manufacture a valve which he invented, and in later years became a leader in the brass plumbing goods industry.

* * *

Edward Toye, 48, head of Joseph Toye Co., Bridgeton, N. J., died June 16 at his home in Centerton, N. J. Mr. Toye attended University of Pennsylvania and Temple University, prior to joining the foundry which his father founded.

* * *

Raymond E. Miller, former production manager, National Malleable & Steel Castings Co., Cleveland, died June 21 while visiting in Findlay, O. Mr. Miller was associated with National Malleable for 54 years and retired in 1949.

* * *

Louis Oberhelman, 69, formerly assistant superintendent, Hill & Griffith Co., Cincinnati, foundry suppliers, died June 14. Mr. Oberhelman, who retired 4 years ago, was associated with the company for 45 years.

* * *

Samuel J. Wagner, 64, for 15 years owner of Sinking Spring Iron Foundry, Reading, Pa., died June 22. Mr. Wagner retired last year.

* * *

Gregory L. Hoen, 75, retired, died June 11, at his home in Eggertsville, N. Y. Mr. Hoen, a native of Buffalo, was associated for 25 years

with National Car Wheel Works, Pittsburgh, and Standard Car Wheel Works, Cleveland for 10 years, as general plant superintendent. He retired 15 years ago.

* * *

John DeMooy, 67, former president of Cleveland Pneumatic Tool Co., Cleveland, died there June 1. A native of Cleveland, Mr. DeMooy was associated with the company from 1901 until his retirement as president in 1943.

* * *

Karl E. Lundquist, 65, founder and vice president, Lake City Foundry Co., Chicago, died July 3. Mr. Lundquist, a native of Sweden, came to the United States in 1905 and founded the company 15 years later.

* * *

Lingle D. Douglas, 81, foundry engineer, died June 28 in Reading, Pa. Mr. Douglas was at one time vice president-general manager, H. E. Mills Mfg. Co., Syracuse, N. Y., foundry suppliers.

* * *

Walter A. Hardy, until his retirement 6 years ago, associated with the William A. Hardy & Sons Brass Foundry, Fitchburg, Mass., died June 4. Mr. Hardy was with the company for over 60 years.

* * *

Frank J. Nemethy, 86, retired foreman in the molding department of Eastern Malleable Iron Co., Wilmington, Del., died May 14.

* * *

Charles F. Jenkins, 85, vice president, Deemer Steel Casting Co., New Castle, Del., died July 2 in Philadelphia.

* * *

Raymond D. Mullen, 59, formerly associated with Herschel-White Foundry Co., Hillsboro, O., died June 7.

* * *

W. J. Torrance, 64, owner of John Torrance & Son foundry, La Crosse, Wis., died there May 4.

* * *

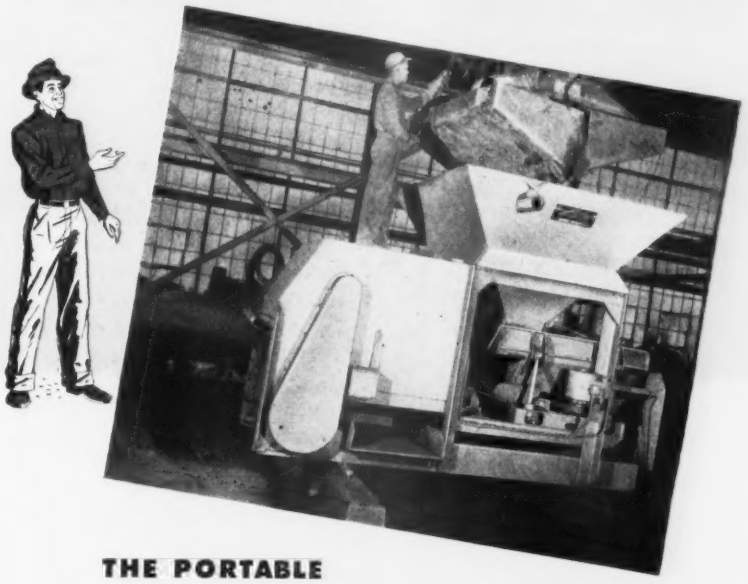
Dilwyn S. Stevenson, purchasing agent, United States Pipe & Foundry Co., Burlington, N. J., died May 16.

Bibliography on Ceramics

Engineer's Council for Professional Development, 29 West 39th St., New York 18, just has published an eight-page bibliography listing more than 150 items under 15 classifications relating to ceramic engineering. Copies of the bibliography may be obtained for 25 cents each.

TODAY'S ANSWER
for HIGH PRODUCTION of
completely conditioned sand

Want to *cut* costs—produce *more* per molder, and *improve* sand and casting quality? Want as high as *70 tons* of thoroughly prepared sand *per hour?* Then today's answer *for you* is the Portable Preparator!



THE PORTABLE
PREPARATOR
Balanced for crane handling from foundry floor to floor

The Preparator thoroughly screens, breaks lumps, magnetically removes tramp iron and shot, double aerates, and adds moisture. It's built to take the roughest treatment—all operating mechanism is protected by dust-tight enclosures.

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Malleable Founders' Society
HOLDS ANNUAL MEETING

CAL C. CHAMBERS
President

FRANK D. BRISSE
Vice President

By FRANK G. STEINEBACH
Editor
FOUNDRY

A GLANCE at past accomplishment and a look toward future problems featured the annual meeting program of the Malleable Founders' Society at the Homestead, Hot Springs, Va., June 22-23. With the malleable industry now operating at a rate of over 1,000,000 tons of castings annually, and with demand for malleable castings for defense constantly increasing, those attending the annual meeting found the program interesting and challenging.

Announcement was made that the following had been elected to the board of directors: G. T. Boli, Northern Malleable Iron Co., St. Paul; Frank D. Brisse, Laconia Malleable Iron Co., Laconia, N. H.; R. N. Hoffman, Michigan Malleable Iron Co., Detroit; and W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland.

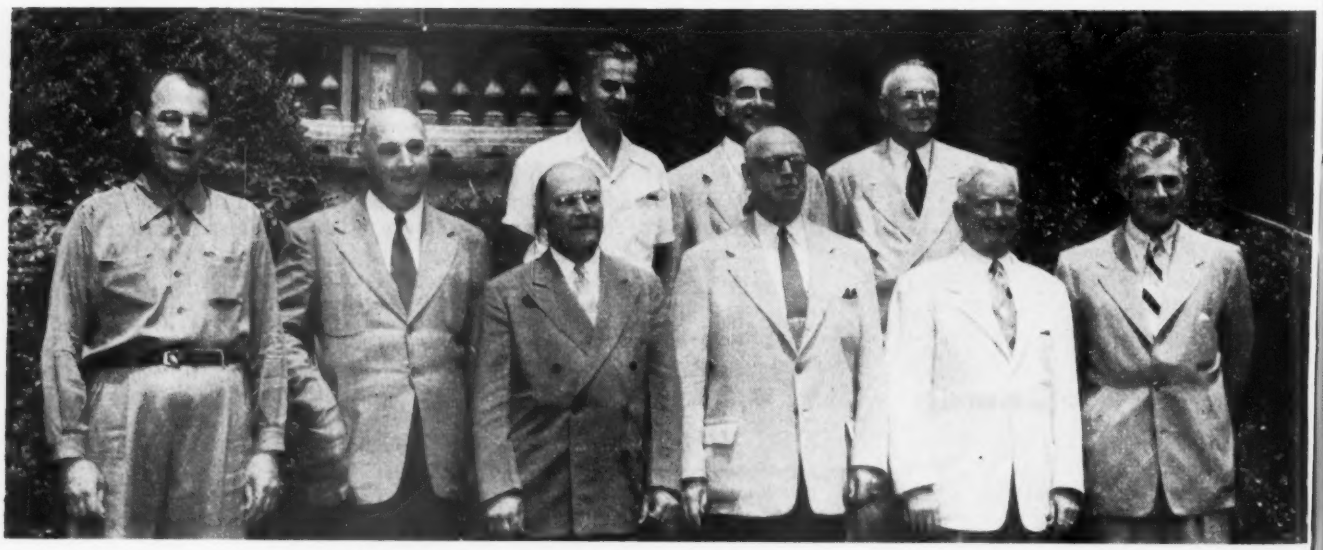
The following officers were elected: President, Cal C. Chambers, Texas Foundries Inc., Lufkin, Tex.; vice president, Frank D. Brisse, Laconia Malleable Iron Co., Laconia, N. H.; treasurer, D. V. Walker, Eberhard Mfg. Co. Div., Eastern Malleable Iron Co., Cleveland; and secretary, managing director, Lowell D. Ryan, Cleveland.

At the annual banquet, the 1951 McCrea Medal was presented to Dr. Harry A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland, for his many contributions to the field of malleable iron. The presentation was made by George E. Bean, managing director, Eastern Malleable Iron Co., Wilmington, Del.

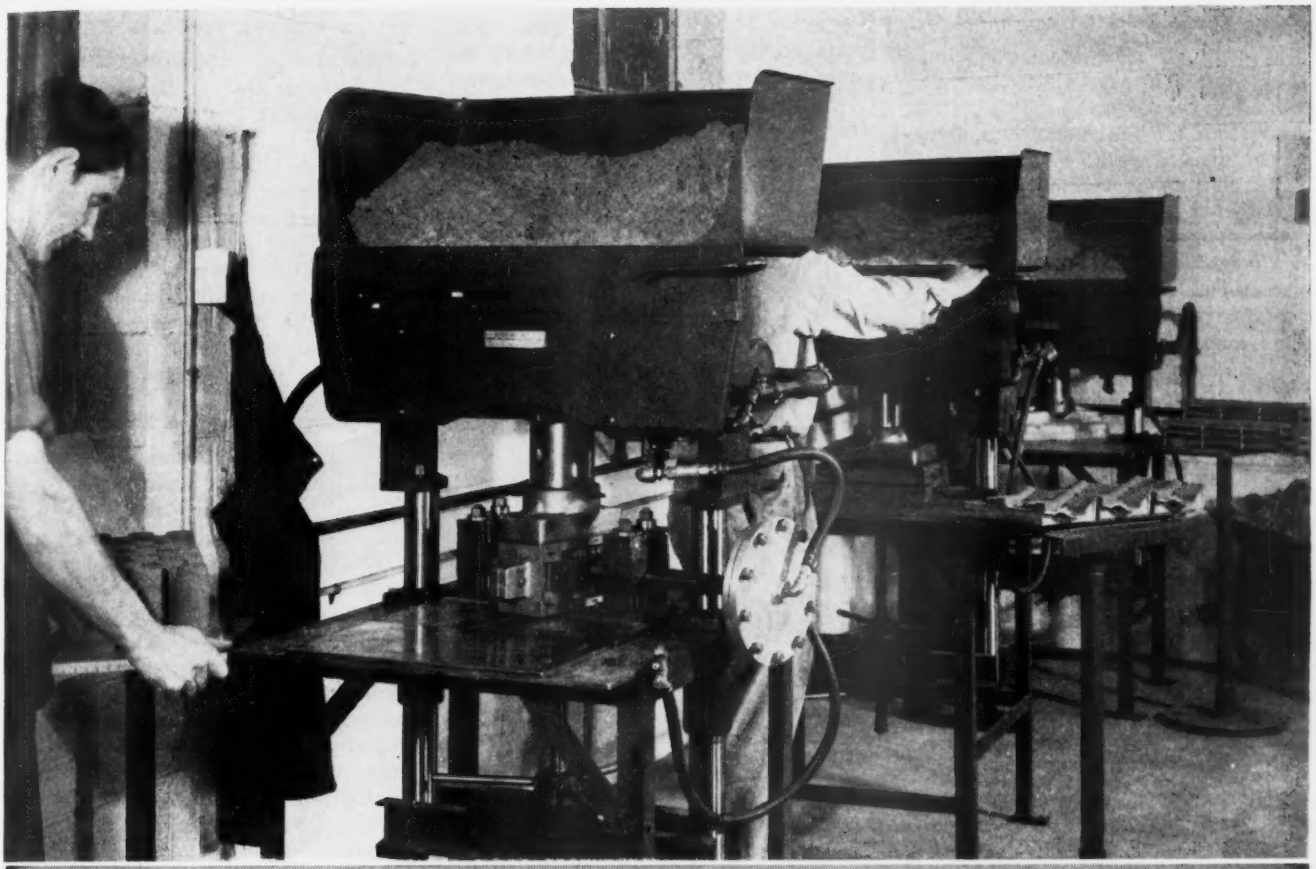
Ralph T. Rycroft, Kencroft Malleable Co., Buffalo, and retiring president of the society, stressed the tremendous value of committee activities in furthering the work of the society. He reviewed some of the highlights of the year's activities in malleable iron, including: Completion of the nodular iron research project; appointment of an excellent industry advisory committee to the Office of Price Stabilization and the naming of Ralph N. Cole, Canton Malleable Iron Co., Canton, Ohio, as a consultant to the OPS; staging of the second market development conference at Rensselaer Polytechnic Institute; continued showing of the motion picture "This Moving World"; publication of "Malleable Iron Facts" and other promotional material; publication of technical and research bulletins; work with the National Production Authority and other Washington defense agencies; and launching of a program for better cost and general accounting practices.

Mr. Rycroft urged producers of

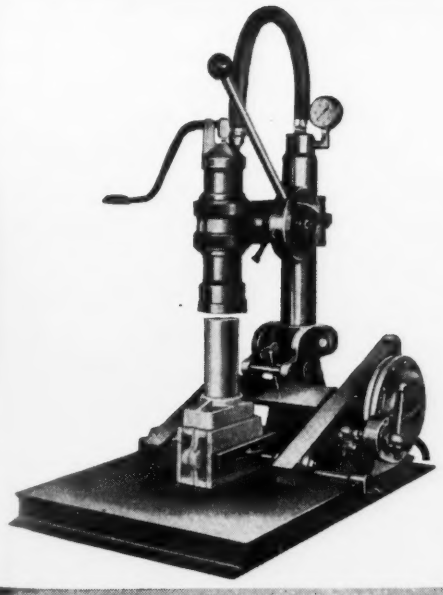
(*Continued on page* 174)



Malleable Founders' Society officers and directors, left to right: George T. Boli, Ralph T. Rycroft, Frank D. Brisse, C. M. Lewis, Max Traum, Cal C. Chambers, H. P. Blumenauer Sr., W. H. Moriarty, W. Scott Roby



REDFORD *No. 2 Stationary Magazine Type* CORE BLOWER



NEW features and functional design permit maximum production with a minimum of effort . . . Accepted in hundreds of foundries as the most efficient machine for the production of cores up to 5 lbs.

Write for Specification Bulletin "F".

Redford Cartridge Type Bench Core Blower

- **The original small core blower.**
- **Proven simplicity—Speed and Flexibility.**
- **Makes cores up to 2 lbs.**
- **Thousands in use.**
- **Write for Bulletin "G".**

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(*Continued from page* 172)

merchant pig iron, steel companies and government agencies to recognize the need for expansion of pig iron production for the foundry industry, at the same time blast furnaces are being built to provide more iron for the steel industry.

R. C. Becherer, Link-Belt Co., Indianapolis, and chairman of the educational committee, reported continuation of contacts with engineering schools on the part of the society. He outlined a proposed "educating the educators' day" which would get technical educators together for a briefing by industry representatives on the properties and applications of malleable iron.

Roy C. Hobson, National Malleable & Steel Casting Co., Cleveland, and chairman of the market development committee, reported on a number of promotional projects undertaken by the society during the past year. He stated that the movie has been shown 360 times to an audience of approximately 26,000 and has been used for 13 television programs. Mr. Hobson also emphasized the importance to the industry of the second annual market development conference at R.P.I. and outlined other promotional activities which have been undertaken.

C. A. Gutenkunst Jr., Milwaukee Malleable Gray Iron Works, Milwaukee, and chairman of the economic stabilization committee of the society, reported on activities of that group in undertaking a survey of the industry to develop cost and sales data. This material was of considerable value to OPS in its studies tending toward the establishement of price control for castings. Ralph N. Cole reported on the activities of the cost committee in developing means of applying the principles of the society cost manual. He stated that three complete rounds of cost meetings had been held in various sections of the country.

Leon J. Wise, Chicago Malleable Castings Co., Chicago, and chairman of the research and product improvement committee, reported that during the year ten shop practice meetings were held to discuss the subjects of gating and feeding, and annealing practice. Testing of bars has been continued and a shop practice engineer has assisted a number of foundries with specific problems. The technical and research department has been concerned with contacts with members, shop practice meetings, cooperation with related societies, and contacts with engineers.

Mr. Wise also reported on the final phase of the nodular iron investigation. He said that the original project was to determine if the new product offered a competitive threat to the industry; if the new technique can be used to advantage in malleable plants to make the normal product; and if the markets of malleable companies can be increased by making this new product. The first two items were discussed in the initial report presented a year ago.

The new report deals with the latter phase of the investigation. It is indicated that the molten white iron available in the malleable foundry may be treated in a ladle and then used to pour castings with section thickness previously considered too large for standard malleable practice. Such castings may be heat treated along with standard malleable castings in the normal annealing cycle or in separate batches in short cycles, whichever proves the most practical.

Expand Research Program

W. A. Kennedy, Grinnell Co., Providence, R. I., and chairman of the technical council, reported on a plan for an expanded society research program. He stated that during the year the following projects were completed: Shot peening; cupola dust suppression; nondestructive testing; and malleable foundry nomenclature. Bulletins are to be issued on a study of proprietory compounds used in the foundry. The study of dust suppression is being continued and an investigation is under way on foundry coke. Other studies will deal with fatigue, white iron sample, cores, quality control, and casting cleaning.

F. D. Brisse, Laconia Malleable Iron Co., Laconia, N. H., and chairman of the membership committee, reported an increase of two members during the year, with a total membership of 75. W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland, and chairman of the finance committee, and D. V. Walker, Eberhard Mfg. Div., the Eastern Malleable Iron Co., Cleveland, treasurer of the society, indicated that the organization is in good financial condition.

James H. Lansing, technical and research director, reported on several projects under way in connection with ASTM specifications. He outlined some of the work undertaken by the technical department in proving malleable iron suitable for particular applications. He also presented a comparison of physical properties of nodular iron, standard and pearlitic and malleable iron and stated that malleable castings, either in the regular or pearlitic form, are available for practically all types of applications within the range of properties discussed.

Speaking on "The Outlook on the Labor Front," Merlyn S. Pitzele, labor editor, *Business Week*, predicted that the threat to peace and security will grow rather than diminish during the year and in the future. The

(*Continued on page* 176)

Dr. Harry A. Schwartz Is 1951 McCrea Medalist

DR. Harry A. Schwartz, who recently was awarded the 1951 McCrea Medal of the Malleable Founders' Society, is manager of research, National Malleable & Steel Castings Co., Cleveland. This award, made annually for outstanding service to the malleable castings industry, honors the memory of Charles H. McCrea, former president of National Malleable & Steel Castings Co.

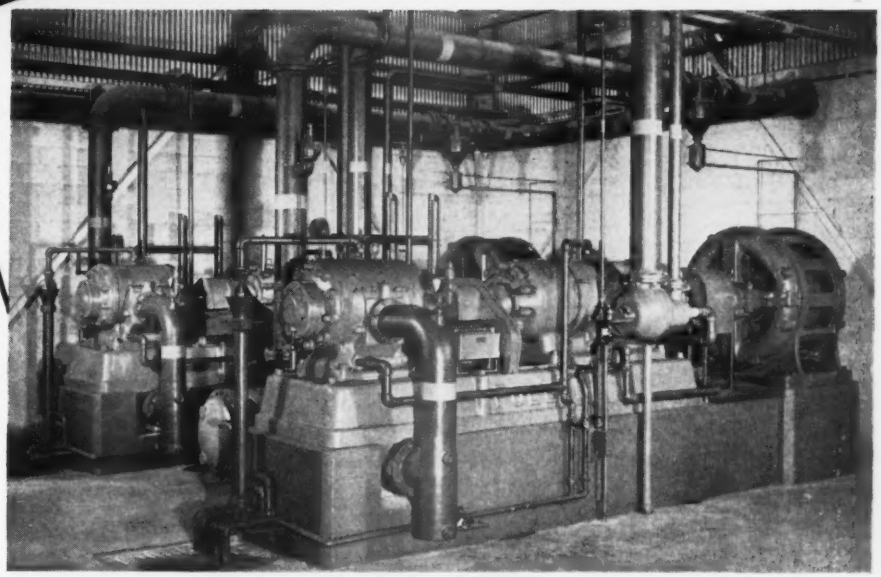
Dr. Schwartz was graduated from Rose Polytechnic Institute, Terre Haute, Ind., in 1901. He joined National Malleable in 1902 at its Indianapolis plant where he served as draftsman, chemist, metallurgist and assistant superintendent. Since 1920 he has been manager of research for the company at Cleveland. Dr. Schwartz is a member of many national and international technical societies with which he has participated actively in committee work. In

DR. HARRY A. SCHWARTZ

1931 he was awarded the John A. Penton Gold Medal of the AFS and in 1939 received the E. J. Fox Gold Medal of the Institute of British Foundrymen. For many years he has been a member of the FOUNDRY editorial advisory staff.

FEW moving parts

means LOW MAINTENANCE
means ECONOMICAL OPERATION
means FULL DEPENDABILITY



FULLER ROTARY COMPRESSORS are engineered and built right to insure a fully dependable source of air power for all steel plant and foundry operations. Moving parts have been kept to the minimum—rotor, bearings and blades—require little attention.

There are no valves to leak, no seats to grind. Blades automatically compensate for wear. Force-feed lubrication to all parts within the cylinder insures constant protection, with minimum wear.

Foundries and steel mills have put Fuller Compressors on the payroll. They've found them to be completely reliable under all conditions of service—and they've found them to be as economical to operate as they are dependable. Why not investigate this modern, efficient compressor the next time you are in the market? Write for Bulletin C-5, illustrating and describing these machines.

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C-215

(*Continued from page* 174)

United States will not be free of peril for many years. He cited four major factors which form the basis of this prediction: 1. Loss of military advantage in the use of atomic weapons; 2. Threat that America will be isolated through Soviet efforts to split the Anglo-American alliance; 3. Vulnerability created by internal division of the American people; 4. Our apathy.

Mr. Pitzele said we must recognize the unusual character of the times. Businessmen working in Washington cannot follow policies in dealing with labor which have proved successful in industry, but must adopt a different approach. To mobilize our entire economy demands co-operation of every segment, including labor. The 1946 election resulted in a reversal for labor after 14 years of phenomenal growth and the present moves of labor indicate an attempt to jump forward far enough to balance the setback provided by the Taft-Hartley Act.

Labor problems in the present defense effort are entirely different than those encountered in 1940-41. Then, a surplus of approximately 8,000,000 workers kept the labor situation from becoming really critical. Today, the excess labor supply is exceedingly small. Also, the economy will not be able to afford strikes, such as were permitted during World War II. This will lead to greater controls and it is probable labor will be invited to handle such controls, possibly through cabinet representation. Mr. Pitzele indicated that while wage control is necessary to check inflation, the ranks of industry are badly split on wage controls at the present. In many cases, industry is joining with labor in demanding wage increases and this will result in a sharp and disorderly upward wage movement. In conclusion, he pointed to the inadvisability of basing any long term policy on orders being issued today. These are interim orders and we will live with interim orders for a long time in the future.

A. J. McDonald, chief, Iron and Steel Castings Section, National Production Authority, Washington, was present and answered a number of questions dealing with present problems facing the foundry industry. He said that the three ferrous foundry advisory committees had been approved and will be activitated shortly. The scrap situation has become critical and while present inventories are on the basis of 12 to 15 days, cold weather probably will bring a serious shortage of scrap. Requirements of foundry scrap the next 12 months are estimated as follows: Steel castings, 2,500,000 tons; malleable castings, 650,000 tons; gray iron castings, 8,500,000 tons; steel scrap for gray iron castings, 2,800,000 tons; high alloy steel, 600,000 tons.

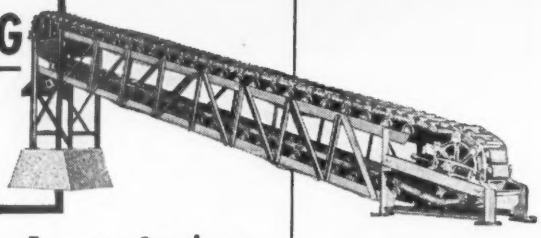
In response to a question on pig iron, Mr. McDonald stated that his department is trying to impress upon the NPA the importance of seeing that the ferrous foundry industry is supplied with pig iron according to its historical percentage. This amounts to approximately 12 per cent of the total production, but it is doubtful if foundries are receiving that amount at the present time. Mr. McDonald also indicated that certain information must be provided with requests for DO ratings for the purchase of equipment (see FOUNDRY, July, page 71).

Work of the society in strengthening the malleable industry with various government agencies was outlined by Lowell D. Ryan, managing director. Beginning with the establishment of a malleable foundry

(*Continued on page* 178)

Bailey

PIG CASTING MACHINE



For Ferrous and Non-Ferrous Smelters and Foundries

Ruggedly constructed for low-cost service, this machine is completely self-contained. If necessary it can be moved by crane and erected wherever needed. Once it is set in place, only an electrical connection is necessary for operation. The complete unit consists of the machine proper, motor, gear unit, variable speed reducer and drive.

CAPACITIES: 3 tons per hour to 50 tons per hour. 15 ft. to 100 ft. in multiples of 5 ft.

STATIONARY WHEEL

for Longer Service— Greater Economy

Bailey Stationary Wheel design eliminates 80% of the moving parts of the conventional type. The moulds are supported by endless chains that run on top of idler wheels which are mounted at stationary positions along the strand.

WILLIAM M. Bailey COMPANY

ENGINEERS

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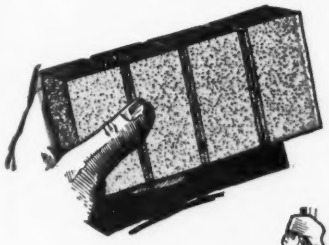
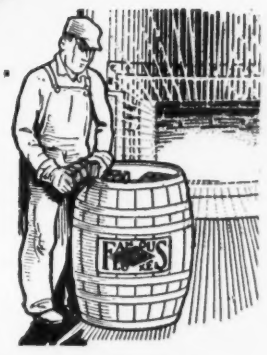
Close the door on casting rejects!

LOST PROFIT AND LABOR CAN BE AVOIDED by using

Famous CORNELL CUPOLA FLUX





EXCLUSIVE SCORED BRICK FORM

The old saying "you must give a good workman good tools to get good work" fits the foundry industry like a glove. Your molders, no matter how good, cannot produce the best castings unless the molten iron is clean. Don't blame them for too many rejects.

Famous Cornell Cupola Flux is the best insurance of clean, more fluid iron—improved castings. Furthermore, it reduces sulphur and keeps slag fluid.

Castings are stronger, cleaner, solid and the grain more even. Machining is easier and smoother.

Cupola operation is improved. Cupolas are kept cleaner. There is less bridging over and less erosion of brick or stone lining. Maintenance down-time and cost is greatly reduced.

ADVANTAGES OF SCORED BRICK FORM:

It is easier to use, ensures greater accuracy in using and reduces waste. You avoid the labor of digging flux out of container, weighing and measuring, and loss up the stack by force of blast.

It takes but a few seconds to lift Famous Cornell Cupola Flux from container and toss it into the cupola with each ton charge of iron. Where charges are smaller or fractional, you break off one to three briquettes (quarter sections) as per instructions.

WRITE FOR BULLETIN NO. 46-B

Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS even when dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves you considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

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Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze Aluminum and Ladle Fluxes—Since 1918.

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CLEANSES MOLTEN ALUMINUM so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive Formula greatly reduces obnoxious gases, improves working conditions. Dross contains no

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to guard your costs better!

After you've fought the battle of high costs, "criticals" and shortages—don't waste materials through careless handling! Tighten your control at every step! See that you have up-to-date scales —and enough scales—throughout your foundry. Look into the advantages of Printweigh in stopping losses that originate through human errors. Whatever your problems in receiving, charging, counting or other weighing operations . . . there's a modern Toledo to do the job with utmost *accuracy, speed* and *dependability.*

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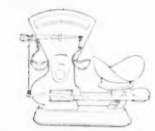
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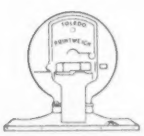
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TOLEDO SCALE COMPANY

TOLEDO, OHIO . . . Toledo Scale Company of Canada, Ltd., Windsor, Ontario

HEADQUARTERS FOR SCALES

(*Continued from page* 176)

industry advisory subcommittee to the Munitions Board in 1949, the society has assisted in the survey of the industry to determine capacity and needs for manpower and raw materials. Representatives of the society participated in the conference which resulted in the establishment of a separate ferrous castings section for the National Production Authority. Shortly after the creation of the Office of Price Stabilization, the society made contact with the director of that office and co-operated in the development of the malleable industry advisory committee to the OPS.

Expect Production Increase

Mr. Ryan stated that with the release of the new 65 per cent requirement for acceptance of DO orders, a greatly stepped-up percentage of production for the mobilization effort may be expected. A study of capacity indicates that increases since the survey by the Munitions Board probably will bring the estimated capacity at the end of the year to 1,300,000 tons and that this will increase to 1,375,000 tons by late 1952. Mr. Ryan pointed out that the increased capacity can be utilized in times of normal production if the industry will do a better job of producing a better product with maximum efficiency, and promoting the product to the fullest extent. As the capacity increases, the magnitude of the task of improved quality and efficiency and the need for promoting the product grows proportionately. While this basically is a job for each individual company in the industry, the society can play an important part in providing leadership in the development of broad promotional plans which can be done best co-operatively.

In a forceful discussion opening the second day's session, Cal C. Chambers outlined an expanded program of society activities for the coming year, including stepped up research activities and a broad promotional campaign to widen and strengthen the market for malleable iron castings.

Maj. Gen. F. H. Griswold, Military Director for Requirements, the Munitions Board, presented an interesting picture of the scope and work of the board. General Griswold recently was appointed chairman of the Foundry Industry Advisory Committee to the Munitions Board and chairman of the 11 foundry industry advisory subcommittees.

Present strength of the Munitions Board is 800 of which approximately 100 are military. The board is un

(*Concluded on page* 180)

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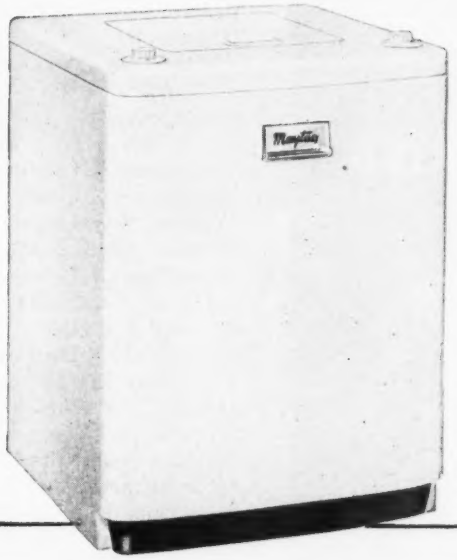

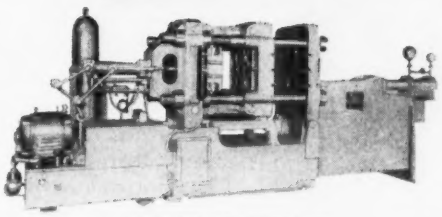

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Hydraulically operated die casting machine for production of aluminum castings.

Battery of KUX Die Casting Machines in operation in the ultra-modern Maytag factory at Newton, Iowa

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Maytag

first name in washers

Since 1907, over 6 million Maytag Washers have been sold—far more than any other. The reason's clear; Maytag makes a wonderful washing machine . . . plus a full line of other home laundry equipment and famous Dutch Oven Ranges. It's logical that KUX, first name in die casting machines, should be used in the quality production of these superior products.

The use of KUX die casting equipment can put YOUR PRODUCT ahead—or *keep* it ahead. Reduce your manufacturing costs—increase the saleability of your product, with quality die castings made on these rugged machines.

Write for illustrated catalog showing complete line of KUX Die Casting Machines

KUX MACHINE COMPANY
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CUPOLA CHARGING MONORAIL
For Dependable CAB-OPERATED MONORAIL SERVICE
Shepard Niles offers you . . .
1. THE WORLD'S MOST COMPLETE LINE OF MONORAIL HOISTS—designed and built to withstand the most severe service—thus providing the widest possible range of machines from which to choose.
2. VALUABLE APPLICATION ASSISTANCE—the result of almost fifty years of specializing in material handling problems in every type of industry.
We welcome an opportunity to study your needs and make recommendations. The tougher your problem, the more reason there is to call in a trained Shepard Niles specialist. He will save you time and cost in subsequent years of operations. Write us today.
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Makes and sells all three lifting tools for airborne shop loads
CRANES • Overhead
HOISTS • Cab Operated
HOISTS • Floor Operated
360 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

(*Concluded from page* 178)

der the secretary of defense and works closely with the Joint Chiefs of Staff. It has no way to spend money but is charged with seeing that the procurement plan of the three services is obtainable.

Present program calls for a sufficient production to support an army of 3,500,000 men, but should be susceptible to rather rapid expansion. In all-out war, the needs of the military would be from five to six times greater than the present defense output. The Munitions Board is a claimant agency for the three branches of the Department of Defense.

The annual meeting program was concluded with an inspiring talk, "Today's World—Tomorrow's Peace," by Rear Admiral Ellis M. Zacharias. In the speaker's estimation, we are living in one of the most important times in the history of our country. We hold all of the cards, providing we know how to play them. Korea was not on the Russian timetable but must be considered our own blunder. Without doubt, the Korean war must be investigated by Congress to determine who is responsible. If we do not find out, these individuals or groups can make bigger and better blunders in the future.

However, Korea can be the biggest blunder made by the Russians since 1917, in the opinion of Admiral Zacharias. Instead of movement toward depression in this country, as was anticipated by the Russians, the Korean war has brought about a rearmament and remobilization which will build up our strength to meet future emergencies.

Speaking from a background rich in experience in the value of propaganda in World War II, Admiral Zacharias insisted that greater attention should be given to that form of warfare. He urged his listeners to write to senators and congressmen insisting that the propaganda agency should be removed from the State Department where at present it is totally ineffective.

In conclusion, Admiral Zacharias discussed the various hot spots around the world and indicated what might happen in the various areas.

Film Covers Abrasives

"Grits That Grind," a color motion picture on abrasives and grinding wheel manufacture, may be bought or borrowed from Norton Co., Worcester 6, Mass. It is a 30-minute 16-mm film showing step-by-step manufacturing processes from mining bauxite in Arkansas to the finished grinding wheels in Worcester.

100% RETURN ON INVESTMENT in one year

with WHEELABRATOR

AIRLESS BLAST CLEANING

LENNOX FURNACE COMPANY, Marshalltown, Iowa replaced nine tumbling mills with a Wheelabrator Tumblast for cleaning gray iron furnace castings. Within a year savings effected through lower cleaning costs and faster production were sufficient to pay for the entire investment. Since that time they have been getting a daily bonus of $35.36.

CLEANING TIME SLASHED 80%—The Wheelabrator cleans as much work in 15 or 20 minutes as could be done in an hour and three quarters in tumbling mills.

SAVES 29 MANHOURS DAILY —Two men clean 17 tons of furnace castings in 16 manhours where five men previously worked a total of 45 hours to clean 16 tons.

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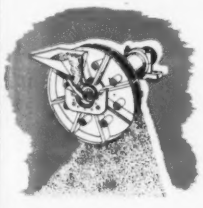
HERE'S HOW YOU CAN SAVE —Based upon the results of thousands of installations, Wheelabrator airless blast cleaning probably can make the same savings for you. An expert analysis of your cleaning problems by one of our engineers will give you complete facts on the results Wheelabrating will provide. There's no obligation, of course. Write for details.



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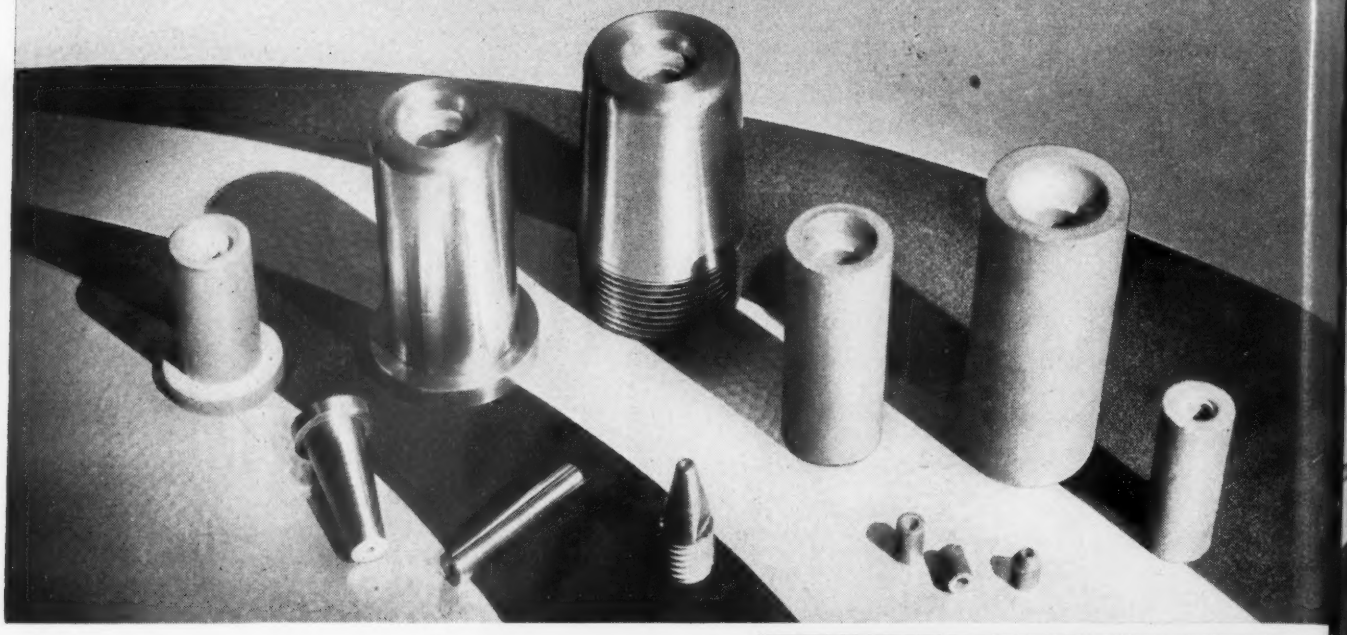
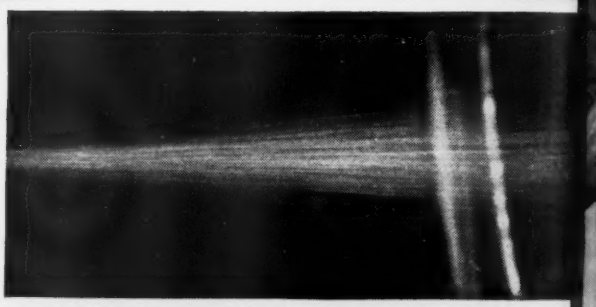
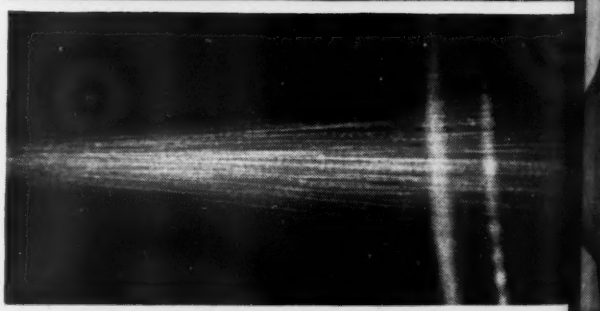
You Can Increase Nozzle Life

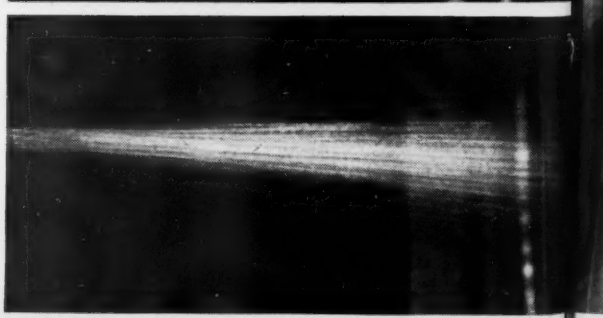




High speed photograph of stream from new iron nozzle — note that stream concentration and abrasive velocity and volume are fair.



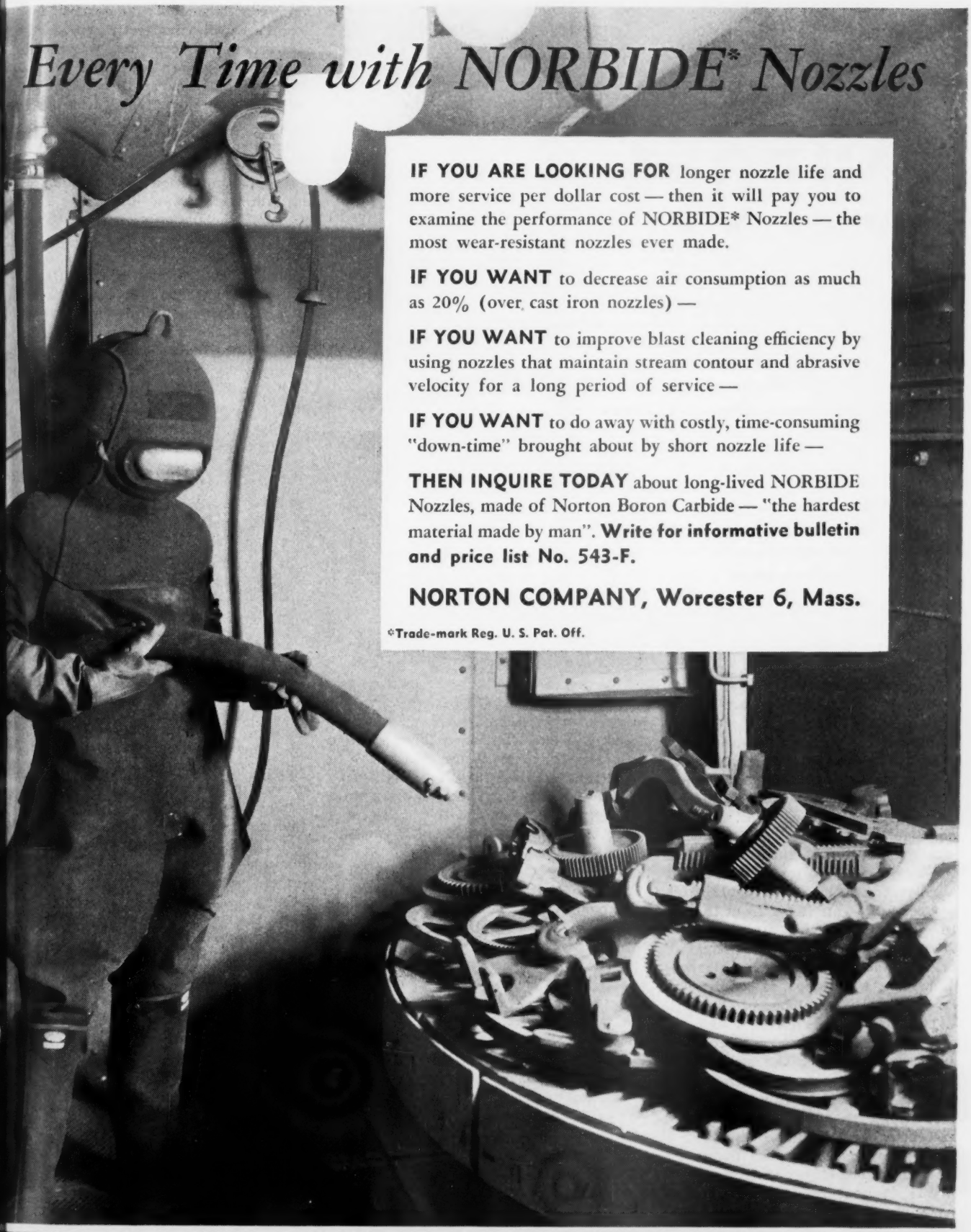
Stream from the same nozzle after three hours with silica sand. Outlet opening worn to twice original size — stream concentration poor, abrasive velocity and volume low.



Stream from Norbide Nozzle after 404 hours with sand — outlet diameter worn only 0.032"—hundreds of hours of useful life remain—marked stream concentration—high abrasive velocity and volume.

NORTON WEAR-RESISTANT PRODUCTS NO

Every Time with NORBIDE Nozzles*



IF YOU ARE LOOKING FOR longer nozzle life and more service per dollar cost — then it will pay you to examine the performance of NORBIDE* Nozzles — the most wear-resistant nozzles ever made.

IF YOU WANT to decrease air consumption as much as 20% (over cast iron nozzles) —

IF YOU WANT to improve blast cleaning efficiency by using nozzles that maintain stream contour and abrasive velocity for a long period of service —

IF YOU WANT to do away with costly, time-consuming "down-time" brought about by short nozzle life —

THEN INQUIRE TODAY about long-lived NORBIDE Nozzles, made of Norton Boron Carbide — "the hardest material made by man". **Write for informative bulletin and price list No. 543-F.**

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How to use the CUPOLA

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis

Recommended procedure in adjusting and burning in the coke bed are discussed in this eighth of a series of articles on the cupola

IT is not possible to establish an empirical formula for predetermining the proper initial cupola bed height for a given operation, but it is possible to suggest a procedure to obtain the optimum bed height.

Before we establish what a correct bed height would be we must emphasize a very important point—the initial bed represents a height existing only at the time of measurement. While this initial height is important, the inference is all too frequent that a correct bed height will ensure a perfect heat. This is far from the actual situation because after the first 20 minutes of the heat the amount of coke per charge and the air input will determine what the bed height will be during the remainder of the heat.

The initial bed height is a function of the coke, the amount of air used (melting rate) and the stock characteristics. It is easily seen, therefore, that these factors vary so much from plant to plant that a general statement cannot possibly apply.

In general, bed heights today are 15 to 20 inches higher than they were before the war, due to lower quality coke, poorer scrap and lower pig iron charges. When pig iron was so short a few years back the beds and splits were made higher than they are now in an effort to correct low carbon conditions.

Coke size will affect the correct bed height. Small coke, because of its greater surface, will consume the oxygen in the blast faster than large coke under the same blast conditions. This means that the point in the bed at which no oxygen exists will be lower with the small coke and a lower bed will suffice. Under these conditions metal temperatures will be lower. Small coke, therefore, will require a higher blast rate to drive the oxygen up and extend the high temperature zone to increase the metal temperature.

Conversely, large coke has less surface so that the oxygen will drive higher before being consumed and a higher bed is required. Higher metal temperatures and faster melting rates result.

When a cupola is operated at a melting rate faster than normally employed, the initial coke bed and the subsequent coke splits must also be higher. The oxygen is driving higher through the bed, and to avoid oxidation more coke must be used.

Stock Size Effect—Properly sized coke will permit minimum bed height and optimum coke ratios. In most instances all coke less than 2½ in. should be removed before charging. The small coke plugs the voids to such an extent that abnormal quantities of coke are required to offset the poor air distribution.

It is customary to measure bed heights in inches above the tuyeres. Some plants also weigh and record the amount of coke in pounds required for a given height. If we assume constant cupola dimensions, the height in inches indirectly represents the volume. A constant weight of coke, however, does not reflect a constant volume because the weight of the coke per cubic foot varies with size and specific gravity.

Burning in the Bed—The coke bed is properly ignited only when the state of combustion of the coke is uniform throughout the bed. This state of combustion is not the same for all cupolas, because the time of fill-up varies. If the fill-up is fast, the bed should be hotter than if the fill-up is slow. The objective is to have the bed at the proper temperature when the wind goes on for the heat. This temperature is correct when iron will show at the tuyeres in approximately 3-5 minutes and the metal temperature at the spout reaches 2800° F in about 10 minutes.

Unless experience has shown that the natural draft of a cupola will produce a uniform burn-in under all weather conditions, it is advisable to use the blower, particularly if time is an important factor.

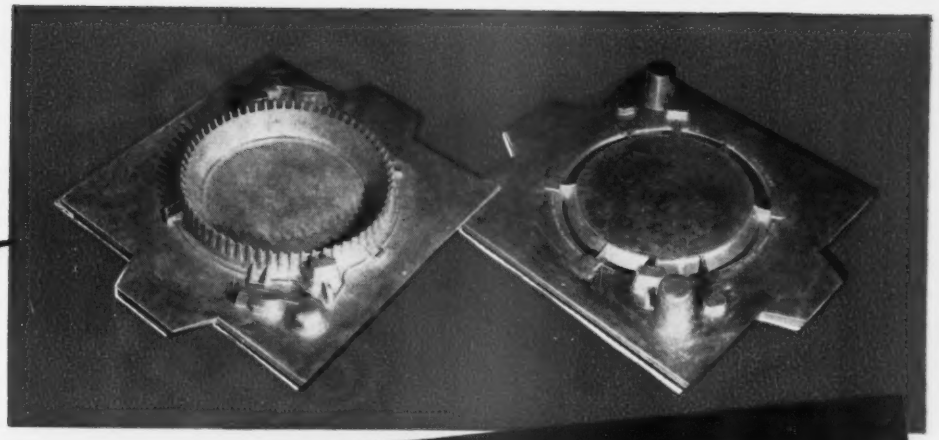
It is not possible to specify an air rate for blowing in the bed which will serve all cupolas, because of the different quantities of coke required for the various cupola sizes. It can be stated, however, that the proper volume is that which will produce the minimum positive draft through the bed. In other words, if the gases at the top of the bed show a definite but low flow over the entire area, the volume is sufficient to distribute the air uniformly throughout the bed with minimum danger of over-blowing. In this manner a fire at the top of the bed (first-half) should show in 5-10 minutes. If the bed is not uniformly ignited, continue the wind for another 4-5 minutes which generally will drive the fire into the areas not burning.

After the first bed is thoroughly ignited it should have a volume at least 12 in. above the tuyeres to supply sufficient heat for igniting the remainder of the bed. If the final bed height is to be 60 in., then the next bed coke should bring the height to about 52-54 in. (above the tuyeres). If time permits, this coke can be ignited by natural draft; if not, again turn the wind on for about 5 minutes and then let the fire soak, which normally will not require over 15-20 minutes. This bed should be uniformly cherry red (not white) with no dark or dull areas. The remaining coke is then added to bring the height to 60 in. The final bed should be level, and the reason for topping off the last 8 in. is to permit levelling off.

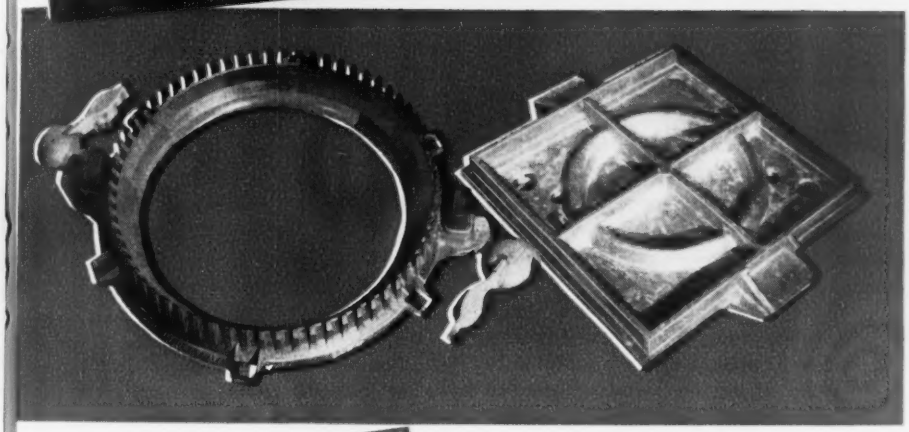
"Lighting off" the bed follows no

(*Continued on page* 186)

Specify



ACCURATE PRESSURE CAST COPE AND DRAG PATTERN SETS



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(*Continued from page* 184)

set procedure. The kindling fuel used is wood, oil, gas or electricity. Unfortunately, none of these mediums will insure uniform ignition day after day because the procedure of application itself is not standardized.

Construction of a proper bed is not difficult and there are certain fundamental factors which, if rigorously observed, will make this operation fool-proof.

Coke per Charge—When conditions permit—that is, with good material, size and other factors in proper balance—an average gray iron mix will require about 275 lb. of coke to melt 2000 lb. of iron. This quantity will permit a fairly fast melting rate, commensurate with the cupola diameter and generally will produce melting temperatures of 2800° F+. When steel is used in the mix, an additional 3 lb. of coke per 100 lb. of steel is required.

Faster than normal melting rates generally will require an increase in the quantity of coke per charge. Conversely, slower melting rates will permit a reduction in the quantity of coke used. Sized coke generally permits a better balance to be made between the coke and the iron with no sacrifice in temperatures, melting rates or iron composition. When the other factors are adjusted, closer control is possible.

It should be mentioned also that the larger cokes are subject to more breakage in handling than the smaller cokes, because of the prevalence of more fissures. In most instances, however, and unless the breakage is extreme, and smaller sizes fill the voids appreciably, this factor does not seriously interfere with operations. Generally the larger size is employed on operations not requiring the extremely close tolerances that high strength iron demands. The materials, too, are usually larger and fairly open stock texture is maintained. Extreme breakage of the large coke will cause slower melting rates and drop in temperatures and often a higher coke ratio is a necessary corrective. This breakage, of course, is undesirable and every producer strives to eliminate it to the best of his ability.

The points discussed in this section refer to cokes regularly sized and within the size range noted. Attention is directed to the effect on combustion when the coke contains a wide range of sizes and this distinction must be kept in mind.

Combustion—The most important chemical reactions occurring within the cupola are those involving the combustion of the coke with air.

As generally written, these reactions are:

(1) $C + O_2 = CO_2 + 14{,}550$ Btu
(2) $2C + O_2 = 2CO + 4{,}350$ Btu
(3) $2CO + O_2 = 2CO_2 + 10{,}200$ Btu
(4) $CO_2 + C = 2CO - 5{,}850$ Btu
(5) $2CO = CO_2 + C + 5{,}850$ Btu

In each instance the Btu shown is the amount of heat released per pound of carbon burned. Equation 2 is the final result of two reactions.

First stage: $C + O_2 = CO_2$
Second stage: $CO_2 + C = 2CO$
Final: $2C + O_2 = 2CO$

The important point concerning these reactions is that they represent individual equilibrium conditions. However, in the cupola there are dynamic conditions under constant change, and some of these reactions oppose each other. This means, of course, that each of these reactions proceeds in accordance with the conditions favorable to it and in magnitudes consonant with overall influences, so that the end products in the cupola represent a composite of the several reactions.

The simplicity of these reactions as written, with no further explanations is very misleading, for they do

(*Concluded on page* 188)

What every foundryman should know about

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Cast beryllium copper as useful as wrought. Age-hardened beryllium copper castings have the same desirable properties as wrought products . . . strength up to 180,000 psi, hardness to 450 Brinell, or electrical conductivity up to 50 percent that of pure copper.

Other important characteristics. Berylco has a relatively low pouring temperature and good fluidity, resulting in maximum detail as cast with minimum machining. It retains ductility at subzero temperatures, has desirable properties over a wide temperature range, high resistance to wear and corrosion.

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Any casting method applicable. Berylco Beryllium Copper is easily adaptable to a variety of casting methods, including sand, permanent mold, pressure, plaster mold and investment.

Berylco is readily processed. High-strength alloys are machined before hardening. High-conductivity alloys can be machined hardened or unhardened. Since Berylco is an age-hardening alloy, tensile strength of solution-annealed castings can be more than doubled by simple low-temperature heat treatment.

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Properties of Berylco Beryllium Copper Casting Alloys

Annealed and Heat Treated Properties	Berylco 20C	Berylco 275C	Berylco 10C and 50C
Tensile Properties			
Ultimate Tensile Strength	150-175,000	140-165,000	95-120,000
Proportional Limit (0.002% Offset)	105-125,000	85-115,000	45- 65,000
Yield Strength (0.20% Offset)	120-155,000	110-125,000	55- 85,000
Elongation % in 2 in.	1-5	1-5	5-15
Rockwell Hardness	C40-45	C42-48	B92-100
Electrical Conductivity, %	20-25	18-23	45-50

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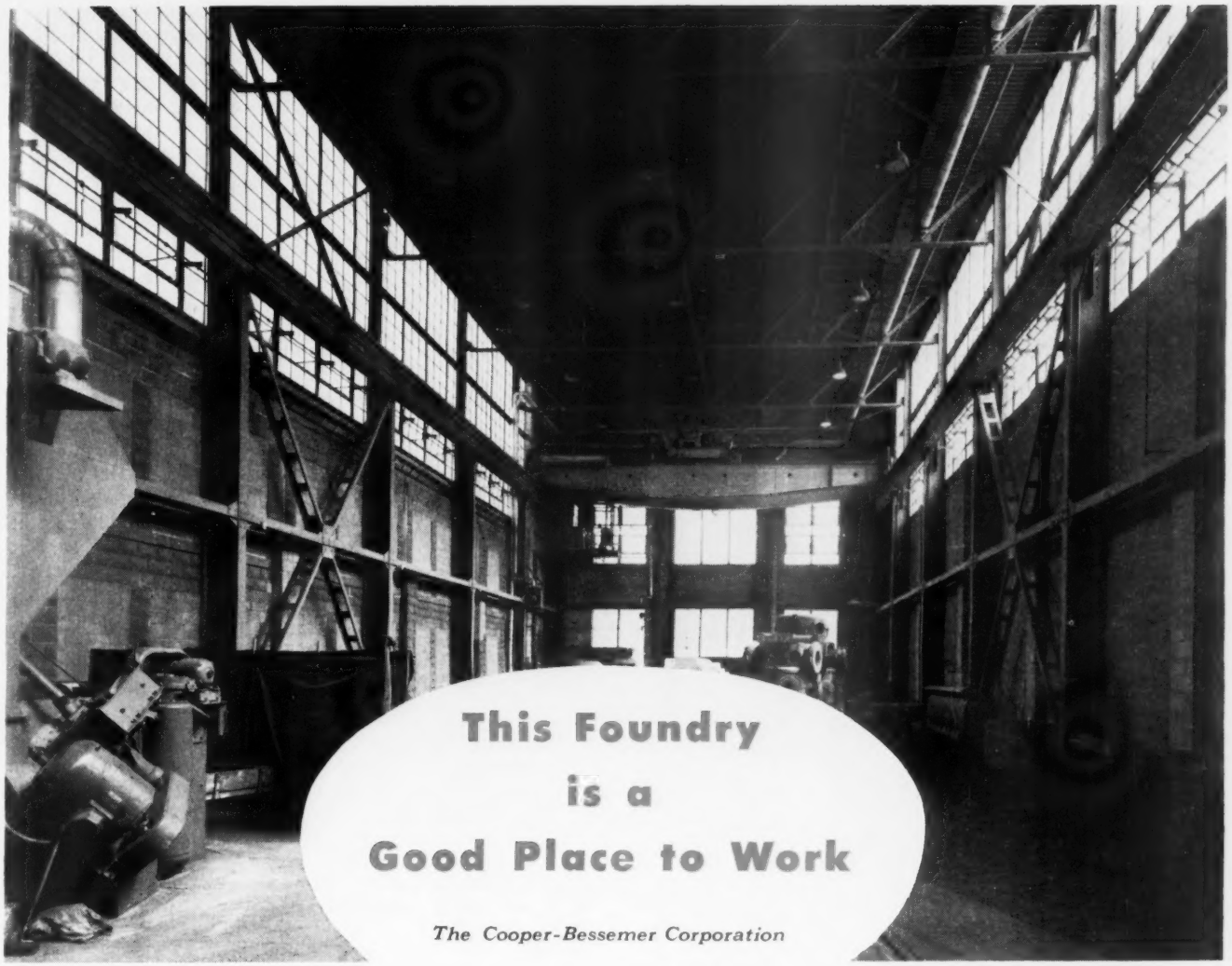


This Foundry is a Good Place to Work

The Cooper-Bessemer Corporation

THIS Corporation with a plant in Grove City, Pennsylvania, has 118 years' experience behind it, having been established as a foundry operation in 1833. Today it operates two foundries in connection with its engine and compressor business. The Grove City Foundry occupies over 100,000 square feet, employs over 500 people, and produces iron castings from ounces to 30 tons at a rate of 2,700 tons per month.

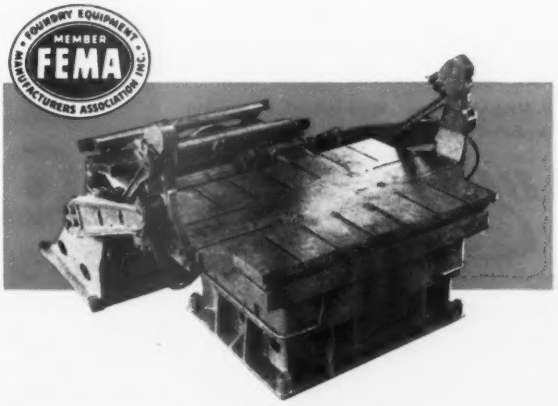
The modern chipping room illustrated above represents one of many things contributing to Cooper-Bessemer's reputation as a good place to work. It is extremely light and clean. Continuous wall type heaters surround the building and overhead exhaust fans provide the cleanest possible atmosphere.

A modern shakeout and sand handling system and additional coremaking equipment are in the process of installation.

Employees' locker and shower rooms are being remodeled. The plant's safety record is so good it has placed in the top three of the heavy machinery division in eight of the last nine years. Cooper-Bessemer's plant slogan is "Management and Labor are Partners in Industry".

Eight Herman Molding Machines, ranging in capacity from 2,000 to 40,000 pounds, help make it a good place to work—because jarring is controlled by a timer; one valve makes them simple to operate; any size mold is clamped and unclamped instantly.

Herman Molding Machines, at Grove City, and other cities throughout the world, have made their way by the way they're made.



Herman **MOLDING MACHINES**

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Concluded from page* 186)

not permit proper interpretation of the possible magnitude under the conditions of actual operation. These reactions all proceed at entirely different rates; for instance, reaction No. 1 at 1800° F proceeds almost instantaneously, while reaction No. 4 at this same temperature is considerably slower. Reaction No. 5 is the reverse of reaction No. 4 and at 1562° F proceeds at a rate 166 times slower than reaction No. 4. We have already mentioned that reaction No. 2 is a resultant of two reactions rather than a direct reaction as written. If this is so, then reaction No. 3 cannot take place except in some minor capacity. In actual operation, when CO is formed, as under reaction No. 4, in the upper part of the stack above the bed, no oxygen is present so that for the most part the CO remains as such in the final effluent gases.

Maximum thermal efficiency can be obtained only when all of the coke is burned to CO_2, with no subsequent decomposition. It is not obvious, though, why this does not, or cannot, take place under actual operating conditions from day to day.

After the air leaves the tuyeres, the initial velocity and direction tends to drive the air toward the center of the coke bed, but the texture of the entire burden above this point immediately imposes its influence. The distribution of gaseous pressure will determine the direction of flow and, while some gas is being passed upward in each section of the cupola, the velocities and rates are not evenly distributed across the cupola area, resulting in the zone of maximum temperature forming the shape of an inverted cone. Of extreme importance is the fact that in all cupolas, the line of least resistance to flow is at the periphery. It is in this diagonal direction that reaction No. 1 ($C + O_2 = CO_2$) proceeds vigorously. The size of materials and the rate of blowing alter the degree of flow, but do not change this imposed direction.

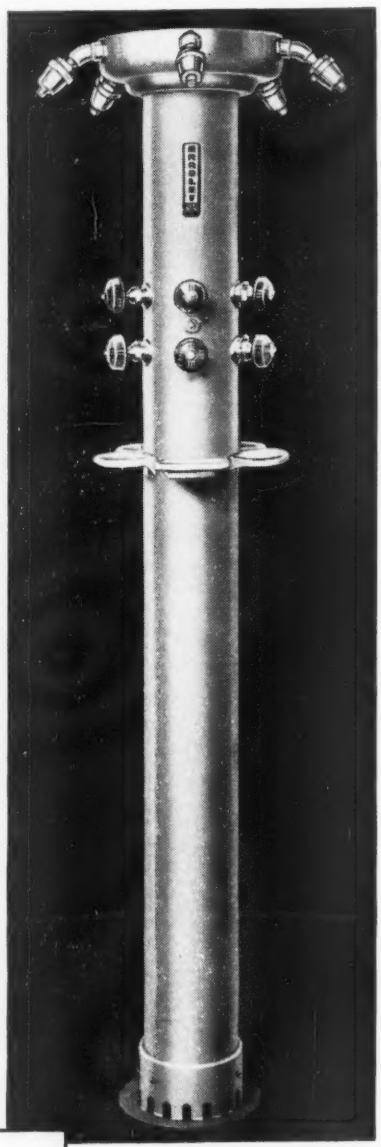
The gases leaving this zone of maximum temperature come in contact with the iron charge on top of the bed, and these gases are responsible for melting the iron, not the coke in contact with the iron. The gases continue upward through the remaining coke and iron charges and reaction $C + CO_2 = 2CO$ (all O_2 has been expended in correct practice) commences immediately above the bed, but decreases in intensity as the temperature decreases. This reaction absorbs 5850 Btu for each pound of carbon thus reacting. The sensible heat of the gases is partially absorbed by the descending stock in the form of preheat. The remaining sensible heat in the gases above the stock line is lost.

(*To be continued next month*)

LOW COST BRADLEY

Multi-Person Column Showers

Require Only Three Plumbing Connections
Two Supply • One Drain



● Here's the answer to your shower requirements at low cost.

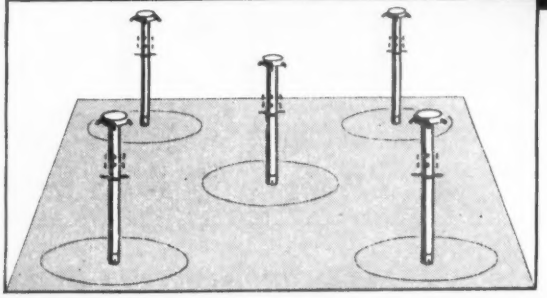
Without the usual partitions of the 3-stall or 5-stall Bradley Showers, the Column Showers are otherwise complete with drain fittings, sprayheads, soap trays, mixing chamber for temperature control with hot and cold water control valves. Ready to install.

Floor space is saved and by placing Showers away from walls, wall waterproofing is not required and space may be used for lockers and benches.

Ideal for Factories, Mines, Camps, Schools, Field Houses, Institutions.

BRADLEY WASHFOUNTAIN CO.
2217 W. Michigan Street, Milwaukee 1, Wisconsin
Distributed Through Plumbing Wholesalers

BRADLEY showers



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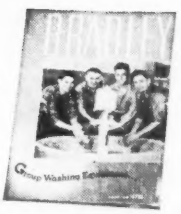


AMA Publishes Booklets

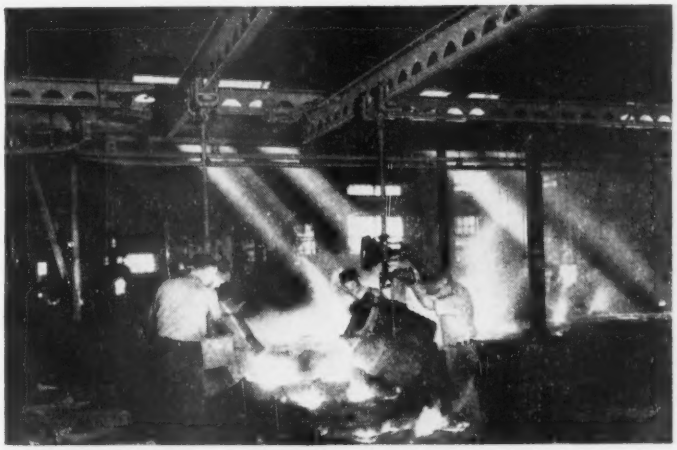
American Management Association, 330 West 42nd St., New York 18, offers another booklet in its office management series entitled "Developments in Office Personnel Administration." Sections cover a "Supervisory Training Program That Works," "Employee Communications—General Motors' Story," "The White Collar Worker in the American Economy," "Defense Production and the National Economy," and "Economic Mobilization Challenges Office Management." Price is $1.25.

Another book, "Sources of Economic Information for Collective Bargaining," covers data now available to negotiators and arbitrators seeking a more factual approach to wage setting. It discusses in detail sources of figures and the nature of arguments cited by both management

(*Concluded on page* 190)

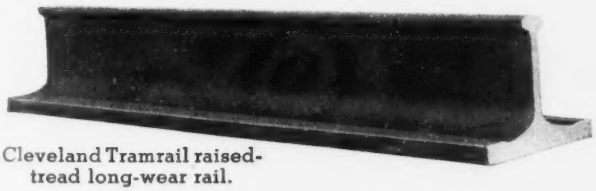
MATERIALS HANDLING IN THE FOUNDRY INDUSTRY

Many hundreds of foundries—grey iron—steel — malleable — brass — bronze — aluminum — magnesium — are enjoying numerous advantages possible with Cleveland Tramrail. They are speeding production and lowering costs by eliminating rehandling and providing straight-line production efficiency. They are reducing floor congestion, removing hindrances and confusion and promoting safety. In many instances, they are eliminating need of plant expansion by installing Cleveland Tramrail.



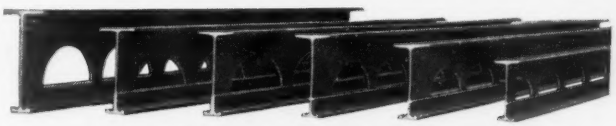
Pouring two 1000-lb. ladles simultaneously in the production of 200-lb. malleable castings. Each ladle is handled on an individual Cleveland Tramrail transfer bridge.

STANDARD ITEMS EASILY COMBINED TO HANDLE MATERIALS OF ANY KIND

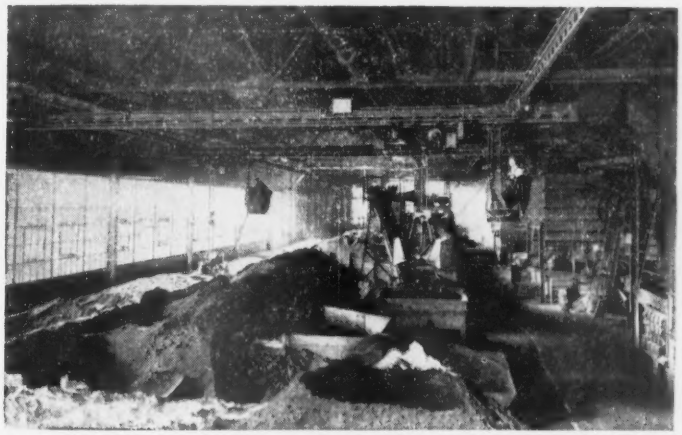


Cleveland Tramrail raised-tread long-wear rail.

Cleveland Tramrail consists of standard items such as rail, switches, carriers, cranes, hoists, grabs, etc., which can be combined in a thousand-fold ways to serve nearly every materials handling requirement.

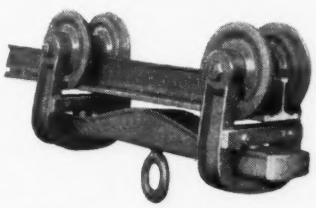


Cleveland Tramrail Archbeam in seven sizes for various loads and conditions.



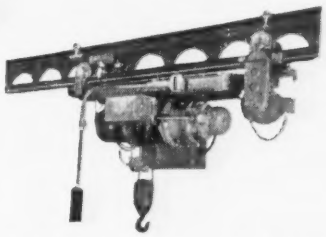
Nine 60-ton gondola cars of sand are unloaded, on an average, every 24-hour working day in a steel foundry, with two Cleveland Tramrail cranes and ½ yard grab buckets.

30,000 INSTALLATIONS



Hand propelled carrier built for long life and easy operation. Wheels have hardened tread and flange; bearings are double race type.

Backed by experience with 30,000 installations in industries of all types, Cleveland Tramrail representatives are in exceptionally good position to serve you. They will gladly advise, survey your plant, make layout or prepare quotation without obligation.



Motor-driven carrier with electric hoist. One of many types built by Cleveland Tramrail.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3810 EAST 286th STREET • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

(*Concluded from page* 188)
and unions in connection with these four criteria most commonly used in determining wage rates: The cost of living, productivity, "going" wage rates, and "ability to pay." Price is $3.75.

Chart Lists Data on Casting Alloys

Alloy Casting Institute, 32 Third Ave., Mineola, N. Y., has available in chart form data of value to designers, engineers and other production executives confronted with metals conservation problems along with normal engineering considerations. A guide to standard designations and chemical composition ranges, the chart lists 27 cast alloy types recognized by the alloy casting industry as standard grades for service in extremes of temperature and highly corrosive conditions.

Data is given on the use of ferro-columbium-tantalum as an alternate to ferro-columbium in the CF-8C type. Wrought alloy type numbers are included so that the corresponding cast alloy grades may be determined, enabling proper use of cast alloy symbols for proper identification of specific casting requirements.

New Book Covers College Research Activities

"Review of Current Research," a 250-page book published by the Engineering College Research Council of the American Society for Engineering Education, outlines the policies and activities of engineering research in the 91 colleges and universities holding membership in ECRC.

In addition to complete research project titles, the volume shows for each school the names of responsible research administrative officers, a brief digest of policies which govern research projects and contracts at each institution, the number of personnel engaged in research activities, the annual expenditures, and special conferences and short courses of interest to research workers.

Copies of the book are available for $2.25 from the Office of Technical Services, U. S. Department of Commerce, Washington 25.

Book Review

Practical Microscopy, by L. C. Martin and B. K. Johnson, cloth, 124 pages, 4¾ x 7¼ in., published by Chemical Publishing Co. Inc., Brooklyn 2, N. Y. Price $2.50.

As the title indicates this book is written for practical application, but to provide proper understanding in use of the microscope a knowledge of optical principles and the physical limitations is advisable, and the authors have endeavored to do that. The book contains 14 chapters relating to magnification, objectives and eye pieces, numerical aperature, illumination, preparation of specimens, polarized light, ultraviolet light, interpretation, etc.

Booklet Discusses Safety

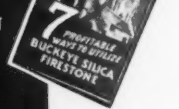
National Safety Council, 425 North Michigan Ave., Chicago 11, has published a booklet entitled "Safety Pays the Smaller Business." The booklet points out that over two-thirds of industrial injuries occur in businesses with fewer than 100 workers. It points out the direct and indirect losses attributable to worker injuries and outlines procedures for reducing the accident rate. It concludes by describing the work of companies and organizations who can offer assistance to plants in increasing worker safety.

LONGER LIFE PLUS ECONOMY ARE YOURS WHEN YOU USE BUCKEYE SILICA FIRESTONE

FOUNDRYMEN know the value of using Buckeye Silica Firestone in their cupolas. On-the-job tests definitely prove that it is the best refractory material that can be used . . . that its longer lasting qualities cut down-time . . . that natural stone like Buckeye cannot be surpassed for service where heat stresses are present.

Many of the leading foundries--both large and small --in the United States and Canada are using Buckeye Silica Firestone for slag hole blocks and for lining and patching the melting zone of cupolas.

Competent engineering advice is yours for making helpful decisions as to the use of Buckeye Silica Firestone in your cupolas. Write today and a Cleveland Quarries refractory expert will come at once to consult with you.



Bulletin 15-B has complete information on Buckeye Silica Firestone . . . send for your copy now!

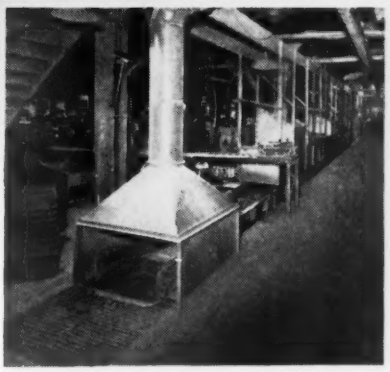
THE CLEVELAND QUARRIES CO.
REFRACTORY DEPARTMENT
1740 E. Twelfth St. Cleveland 14, Ohio

BUCKEYE
"FOR THAT EXTRA SERVICE"
SILICA FIRESTONE

ANNOUNCING THE HEWITT-ROBINS

Vibra-Veyor

UP TO 200 FEET OF PAN LENGTH ON ONE VIBRATOR!



A Better, Faster Way To Move Hard-To-Handle Materials

Here's the machine to convey anything you can't handle with a belt conveyor! Hot or cold . . . wet or dry . . . lump or pulverized . . . packaged or bulk . . . Hewitt-Robins' new Vibra-Veyor® moves it quickly, quietly, efficiently, at low cost.

Convey material up to 200 feet on one vibrator! Run the Vibra-Veyor horizontally . . . down-hill . . . on grades up to 10% . . . all with *one* vibrating unit . . . save on power!

Load it to the hilt! Load the Vibra-Veyor at several points along the pan—with practically any material—and it won't bog down. Capacity is limited only by the size of the troughed pan.

Give it rough shock loads! Pan sections are supported by tough malleable iron rockers and soft coil springs . . . *springs whose sole function is to counteract shock loads.* The Vibra-Veyor is amazingly quiet; like the famed Hewitt-Robins Floatex®, its vibrating mechanism is full floating.

Install it easily! The Vibra-Veyor requires no special foundation because there's no vibration in the base structure. Your own men can anchor it easily. Maintenance is simple; only four points to lubricate!

Use it for any material! Vibra-Veyor applications are almost limitless. Tell us your hard-to-handle materials handling problem, and we'll build a Vibra-Veyor to solve it. (For example, it's ideal as a foundry mold shakeout conveyor, with multiple feeds along its length.)

Write for Bulletin 135 and get the whole story. Robins Conveyors Division, Passaic, New Jersey.

A MECHANIZED FOUNDRY BENEFITS EVERYONE

FEMA MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

HEWITT-ROBINS

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HEWITT-ROBINS HR **INCORPORATED**

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

Medal Awards Made by Institute of British Foundrymen

H. MORROGH
. . . E. J. Fox Medal

E. S. RENSHAW
. . . British Foundry Medal

S. J. SARGOOD
. . . British Foundry Prize

A. S. WORCESTER
. . . Meritorius Service Medal

H. Morrogh, research manager, the British Cast Iron Research Association, was awarded the E. J. Fox Medal for 1951 at the recent convention of the Institute of British Foundrymen. It recognizes Mr. Morrogh's pioneer work on nodular cast iron and his contributions to research on cast iron over a period of years. Mr. Morrogh joined the staff of the British Cast Iron Research Association in 1934 at the age of 16, working first in the metallographic department. In 1942 he was appointed senior research officer and in 1945 research manager. Mr. Morrogh was awarded the Andrew Carnegie Gold Medal by the Iron and Steel Institute in 1947.

E. S. Renshaw is the 1951 recipient of the British Foundry Medal, and **S. J. Sargood** is the winner of the British Foundry Prize. Basis of the awards is their joint authorship of the paper, "Some Modifications in Cupola Design," adjudged the best presented to the IBF during the past year. Mr. Renshaw received his metallurgical training at Sheffield University and his works training at the Sheepbridge Coal & Iron Co. Ltd., Chesterfield. After three years as assistant metallurgist with the Sheepbridge Stokes Centrifugal Castings Co. Ltd. and a period in metallurgical consultant work, he joined Henry Ford & Son Ltd., Cork, Eire, as metallurgist in 1929. Transferring to Ford Motor Co. Ltd., Dagenham, in 1932, Mr. Renshaw has been head foundry metallurgist there since then. Mr. Sargood joined the Ford company at Dagenham in 1935 as assistant foundry metallurgist. He has been engaged on production control and on technical developments, including work on the design and operation of basic and acid cupolas. Trained at the Beaufoy Technical Institute, London, Mr. Sargood was engaged for several years on chemical analysis and works investigations. He was with the Chemical Defense Research Station of the War Department prior to going with Ford Motor Co. Ltd.

A. S. Worcester was presented the Meritorious Service Medal in recognition of his valuable services to the IBF in many capacities over a long period. Educated at Thames Ditton and Kingston-on-Thames Technical School, Mr. Worcester for the last 25 years has been managing director of Kaye & Co. (Hudds.) Ltd. Previously he was foundry foreman and manager of Gimson & Co., and later foundry manger of Taylor & Hubbards, Leicester. Mr. Worcester is a past president of the West Riding Branch, an original member of the institute's Technical Committee and has been active in the education and training of foundry apprentices for many years.

British Conference

(*Continued from page* 83)

the institute 34 years ago, quoted the words of a loam molder of his firm, to whom a presentation had been made on his retirement after 55 years' service, and who said that foundry work was a grand craft, and that after more than 50 years' practical work he was still learning. There seems to be less enthusiasm among the younger men today, and Mr. Gresty looks upon the institute as the most powerful influence for the encouragement and development of pride of craft, provided that it continues its policy of building up its membership from all grades of foundry workers.

The science of the metallurgist has promoted considerable advances in foundry technique. The speaker mentioned that, less than 40 years ago, the British Admiralty specification for cast iron called for a minimum tensile strength of 9 tons per sq in. During World War I this requirement was raised to 11 tons for certain castings, and this caused perturbation in foundry circles. Today, cast iron having a tensile strength of over 40 tons per sq in. can be produced. Also, despite the shortage of skilled labor, more castings are produced than ever before. The speaker then referred to the progress made in working conditions in foundries. Certain difficulties still must be overcome, particularly in the jobbing foundries, due to the very varied character and range of size of their work. However, said Mr. Gresty, it is essential not to lose sight of the fact that the prime function of a foundry is to produce castings. He was strongly of the opinion that the solution of many of the highly practical problems remaining to be solved, could be found by the exercise of individual ingenuity.

Following the presidential address, Dr. R. W. Bailey, research consultant, Metropolitan-Vickers Electrical Co. Ltd., Manchester, delivered the Edward Williams Lecture, for which he had chosen the title: "The Properties of Materials and the Engineering Uses of Cast Metals." For engineering uses the term "properties" usually refers to strength, elasticity, ductility, ability to withstand repeated loading and shock, which would ensure reliability under operating conditions of loading and temperature. In addition, there are such physical

(*Continued on page* 194)

PSC
Designed-for-Job
CONTAINERS...

SPEED VOLUME ANNEALING OF SMALL ARMAMENT PARTS

The basket in the upper left was designed for an aircraft plant for annealing aluminum and magnesium castings. With movable sides and trays, it cuts handling time materially. The perforated pot at right was furnished a defense contractor for fast handling of small parts at a Homo furnace. Some PSC designed-for-the-job fixtures have eliminated as many as three complete handlings.

Furthermore, PSC welded alloy units save time because, being 2/3 lighter than cast equipment, they handle faster; and require less time to attain pot heat. A recent study of one customer's cycle showed a total saving of 5 hours.

Let our technical staff work with you in devising time-saving units. As pioneers of light-weight, sheet alloy, heat-treating containers and fixtures, we make available to you a wealth of designing and production know-how. We furnish equipment in any size. Send blue-prints or write as to your needs.

PSC "Light Weight"

Heat-Treating Equipment for Any Product and Any Metal

Carburizing and Annealing Boxes
Baskets · Trays · Fixtures
Muffles · Retorts · Racks
Annealing Covers and Tubes
Pickling Equipment
Tumbling Barrels · Tanks
Cyanide and Lead Pots
Thermocouple Protection Tubes
Radiant Furnace Tubes and Parts
Heat, Corrosion Resistant Tubing

THE PRESSED STEEL COMPANY

of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

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The Continuous Wheelabrator® Tumblast

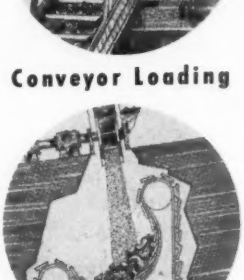
LOADS AND UNLOADS AUTOMATICALLY

It is no longer necessary to waste hours each day in starting, stopping, loading and unloading operations. The Continuous Wheelabrator Tumblast turns these waste motions into productive time as it is loaded and unloaded automatically.

Conveyor Loading

CLEANS AT HIGH RATE OF SPEED

Work progresses continuously through the machine, passing within the crossing abrasive blasts of two Wheelabrator units. The result is a fast, uniform removal of all sand and scale. Production up to 39 tons an hour has been attained in a large automotive foundry.



Tumbling Method

PRODUCES AN ENDLESS FLOW OF CLEANED PARTS

The Continuous Tumblast maintains a steady, uniform flow of work through the cleaning department and thus lends itself to "in-line" production. It can be adjusted for speed to meet any desired standard of cleaning quality.

Built in five standard sizes. Write for details.

Adjusting Angle

Wheelabrator® AIRLESS BLAST CLEANING

American WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka 2, Ind.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST CLEANING EQUIPMENT

(*Continued from page* 192)

properties as density, thermal expansion, thermal conductivity, electrical resistance and magnetic properties. Since most engineering structures have to be designed to transmit loads strength would be considered as having priority in importance, with ductility as a partner, but, as regards ductility, the lecturer held that it is frequently over-valued as a property. He stated that an assured ductility of 1 per cent is likely to be adequate for safety in most engineering uses.

The serious entry of castings as an alternative to wrought parts occurred with the production of steel castings. Tests show that a steel casting can give the properties a high-class forging when the metal is clean, and segregation is negligible; these tests were made upon a large flywheel, cast in the usual sand mold. The lecturer referred to the field of usefulness of castings at elevated temperatures. The ability of metals to withstand loading in service at elevated temperatures depends upon the extent to which they undergo permanent deformation or creep under load, and a very extensive field of special testing has come into existence the last 30 years to determine the metal behavior in this respect.

Discusses Fatigue Resistance

Reference was made to the outstanding example showing a full appreciation of the importance of material properties in influencing the engineering use of cast metal, in the work done to improve the strength and ductility of cast iron, and particularly in investigating the use of cast iron for crankshafts of internal combustion engines. The lecturer then discussed the ability of a part to resist fatigue. A vast amount of fatigue testing of metals has been carried out, of which only a small part can be said to have had much influence upon the choice and use of materials. When a part fails under these conditions, change in design is usually the only satisfactory remedy. There are, however, useful fatigue testing machines of practical importance when the tests are applied to actual parts, and such machines are described in the paper. The lecturer pointed out that many parts which appear to fail by fatigue do so, not under millions of applications of stress, as in the common fatigue test, but under a comparatively small number of applications of excessive strain. This property is best investigated by the applied strain type of machine. A cast material having good behavior in this respect would

have substantial claims for use as an engineering material.

Reference was made to the interesting possibilities resulting from the development of nodular cast iron, and the development of wrought ferritic steels for high-temperature service. There seems to be good grounds for hope that the range of usefulness of cast iron for high temperature steam plant may be increased.

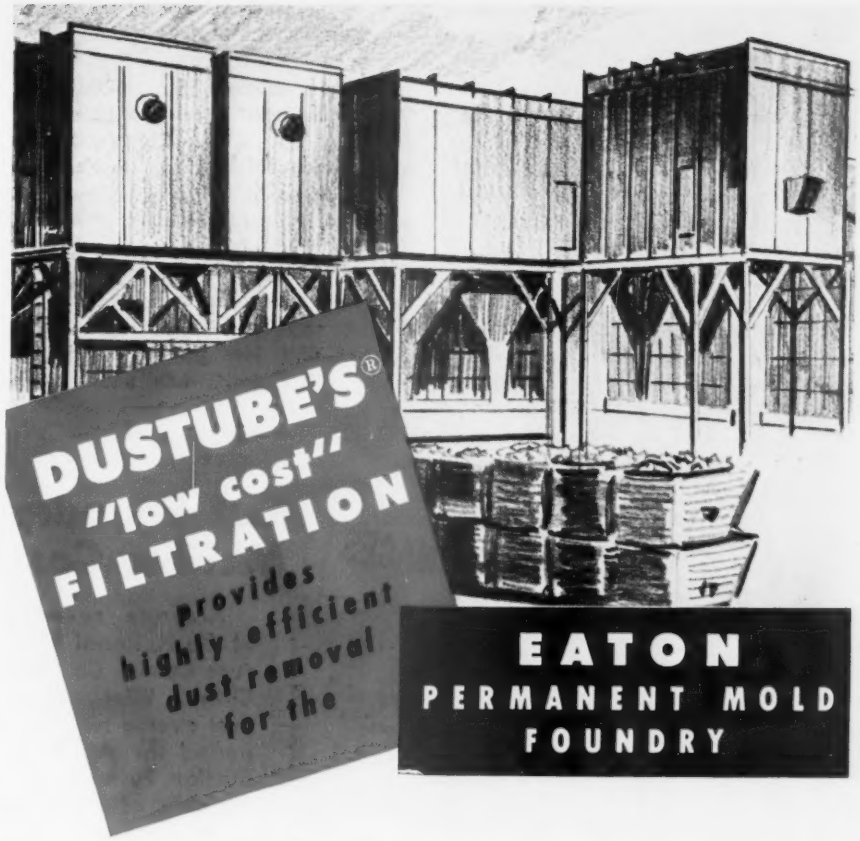
For very high operating temperatures which gas turbine development has necessitated it is recognized that superior alloys may be impracticable in wrought form, or may present production difficulties which would be avoided by castings; consequently, particular interest has been taken in the lost-wax process of precision casting, which accounts largely for its most common application to the production of gas turbine blades.

Wide Field for Castings

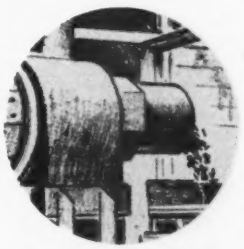
In his conclusion, the lecturer stated that he had endeavored to convey the view that for engineering uses castings, where they may offer an alternative to wrought metals, have as wide a field of use as their physical properties justify, and their competitive position allows.

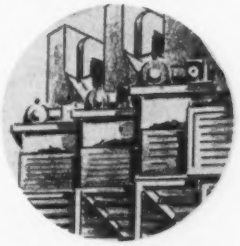
The 17 papers presented at the technical sessions covered a wide variety of subjects. The first paper was the exchange paper of the American Foundrymen's Society: "Thermal Considerations in Foundrywork," by Dr. Victor Paschkis, member of the Heat Transfer Committee of the society. In this paper, the author presents a critical review of one aspect of the casting field—that of heat flow and heat transfer. After briefly reviewing the fundamentals of heat transfer, he shows a flow diagram throughout the various processes operated in the foundry, where heat losses occur. He reviews various methods of making thermal studies —by direct observations, by model experiments, and by mathematical methods. In the latter, he describes the operation of the analogue computer. He refers to the work done by the Heat-Transfer Committee of the AFS, and mentions some remaining problems to be investigated.

The exchange paper from the Association Technique de Fonderie, Paris, was by Marcel Chaussain, Cie, des Forges de Chatillon, Commentry et Neuves Maisons, Montluçon. The subject of the paper was "Platinum-Platinum/Rhodium Thermocouples and Their Industrial Application." The author states that the progressive development of industrial pyrometry has finally led to a method of calibration by a standard reference



Grinding


Rotating Mill


Blast Cleaning

ALL foundry cleaning operations of the world's largest producer of permanent mold gray iron castings, the Eaton Manufacturing Company, Vassar, Michigan, are ventilated by eight Dustube Collectors. According to Mr. Edward C. Hoenicke, General Manager of the Foundry Division, they are "pleased with the low cost operation and high efficiency of the Dustubes and are very proud of the cleanliness of our cleaning department."

Equipment ventilated includes seven Wheelabrator Tumblasts, a complete grinding room with both snag grinders and end grinders, tumbling mills, and a large continuous rotating mill.

Dustube's high efficiency and low cost operation are a result of its simple, effective design. There are no abrading metal parts to damage the cloth tubes. The perfected method of shaking the tubes removes as much of the accumulated dust as is commensurate with collection efficiency and resistance requirements. Inspection and necessary lubrication are readily and safely made on the clean air side of the collector.

Let Dustube engineers show you how you can eliminate the dust problem in your foundry at low cost. Write today for full details.

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dustube® COLLECTORS

curve, enabling the Pt-PtRh thermocouple to be used for temperatures up to 1720° C. A particular testing technique has enabled the degree of ageing of thermocouple wires to be measured in various contaminating media, with the result that thorium oxide has been found to afford the best protection against contamination. Used for temperature measurements in steel baths, thorium oxide shielding has permitted accurate values to be obtained with the instruments normally used in thermo-electric pyrometry. Pyrometer rods have been devised for measuring steel bath temperatures in high-frequency, arc, and open-hearth furnaces.

"Factors Affecting the Solubility of Carbon in Iron" was the title of a paper by Dr. R. V. Riley, manager, research department of the Staveley Coal & Iron Co. The paper describes an investigation of factors governing the solubility of carbon in cast iron. Carbon solubility in iron was determined in selected atmospheres of hydrogen, oxygen, nitrogen and air, at normal and low pressures, and in vacuo. The work has shown that available knowledge of the form of the liquidus of iron-carbon alloys containing over 4.5 per cent carbon is incomplete. The rate of solution of carbon depends upon: (a) temperature of the molten iron; (b) concentration of carbon in iron; (c) mixing of the carbon with the molten iron; (d) nature of the carbonaceous material and surface characteristics; (e) the presence of agents which may interfere with or assist carbon solution. It is shown that the normal cupola atmosphere is not conducive to the production of high-carbon iron. Calcium carbide additions have specific action in raising the carbon content of cupola-melted iron. With regard to the action of the atmosphere, vacuum is the ideal, and oxidizing gases are the worst.

Investigate Synthetic Resins

"Synthetic Resins in the Foundry" was the subject of a Report by Subcommittee T.S.30 of the Technical Council of the institute. The terms of reference of the subcommittee, whose chairman is G. L. Harbach, are: To investigate the use and development of synthetic resins for core binders, molding sands, and other foundry applications. The report covers urea-formaldehyde resins and phenol-formaldehyde resins. It deals with their applications in the foundry generally, for ferrous castings, nonferrous castings; discusses the aspects of comfort and health of operatives. In its conclusions, the report states that accepted methods for oil-sand mixtures must not necessarily be carried on with a changeover to resin sand, and the new binder must be treated with respect and methods adapted to suit its characteristics.

A contribution by B. Levy, director of B. Levy & Co. (Patterns) Ltd., London, dealt with "Some Present-day Practices in Patternmaking." The author lists seven primary factors which lead to a correct expenditure on appropriate pattern equipment:

1. Number of castings to be produced in single batches and the maximum future requirements.
2. Equipment available in the particular foundry and the manner chosen for molding.
3. Type of labor to be employed, i.e, skilled, semiskilled, or unskilled.
4. Considerations of handling the pattern, arising from such obstacles as fragile design, compound curves on thin sections, warping or possible distortion.
5. Amount of coring and type of coreboxes suitable.
6. Possible modification of component design to facilitate molding and

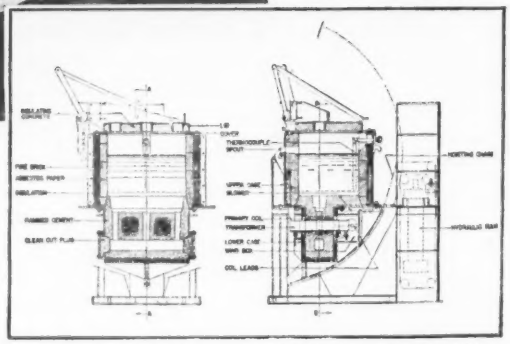
(*Continued on page* 199)

AJAX TAMA-WYATT INDUCTION FURNACES

Cut Foundry Melting Cost

Accurate records at the National Pressure Cooker Co., Eau Claire, Wisc., show that over a two-year period the AJAX Induction Furnace was capable of reducing melting costs by as much as 40%.

Partial view of National Pressure Cooker Co.'s melting room showing AJAX Induction Furnaces.



Cross-section drawings of 166 kW. twin-coil AJAX Induction Furnace with hydraulic tilting device, same as shown in photograph above.

Due to the nature of their use, pressure cooker castings must maintain exceptionally high standards of casting quality. Not only does the induction furnace effect a saving in melting cost but, in addition, working conditions are greatly improved.

Note from the diagram above that the operation of the AJAX Furnace is based on the induction principle, whereby energy is transmitted to the molten charge without actual contact, through the refractory walls. Only the metal is heated, and therefore there are no resistors or other parts having a higher temperature than is absolutely necessary for properly melting the charge. A gentle movement of the bath insures uniform temperature and homogeneous mixing of the ingredients. Linings are made of inert refractories which do not contaminate the melt. Temperature control is entirely automatic.

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AJAX TAMA-WYATT INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

How to Improve Parting at any Foundry Temperature

Use **"dag"** colloidal graphite dispersions. They work at any temperature to be met in the foundry . . . even up to 5000° F. in inert atmospheres.

Colloidal graphite, when applied to molds, chills and patterns, produces an unusually slippery dry film because of its peculiar arrangement of atoms. Parting is made easy and the film is so thin that critical casting tolerances are not affected at all.

Molds and patterns so treated give superior reproduction and smoother casting surfaces. Less finishing is required, often none at all. Rejects are fewer and inspection takes less time. Mold life is lengthened.

"Dag" dispersions can be used, too, for lubrication of flask pins, shoulder screws and push pins. They eliminate binding and stripping, an important saving in time and money.

"Dag" water dispersions also eliminate or reduce the choking fumes and smoke usually caused by conventional petroleum-base parting compounds, thus improving shop conditions.

The use of **"dag"** colloidal graphite in the foundry is explained fully in a new bulletin that is available without obligation. Write today to Acheson Colloids Corporation, Port Huron, Michigan, for your copy of Bulletin #425-14H.

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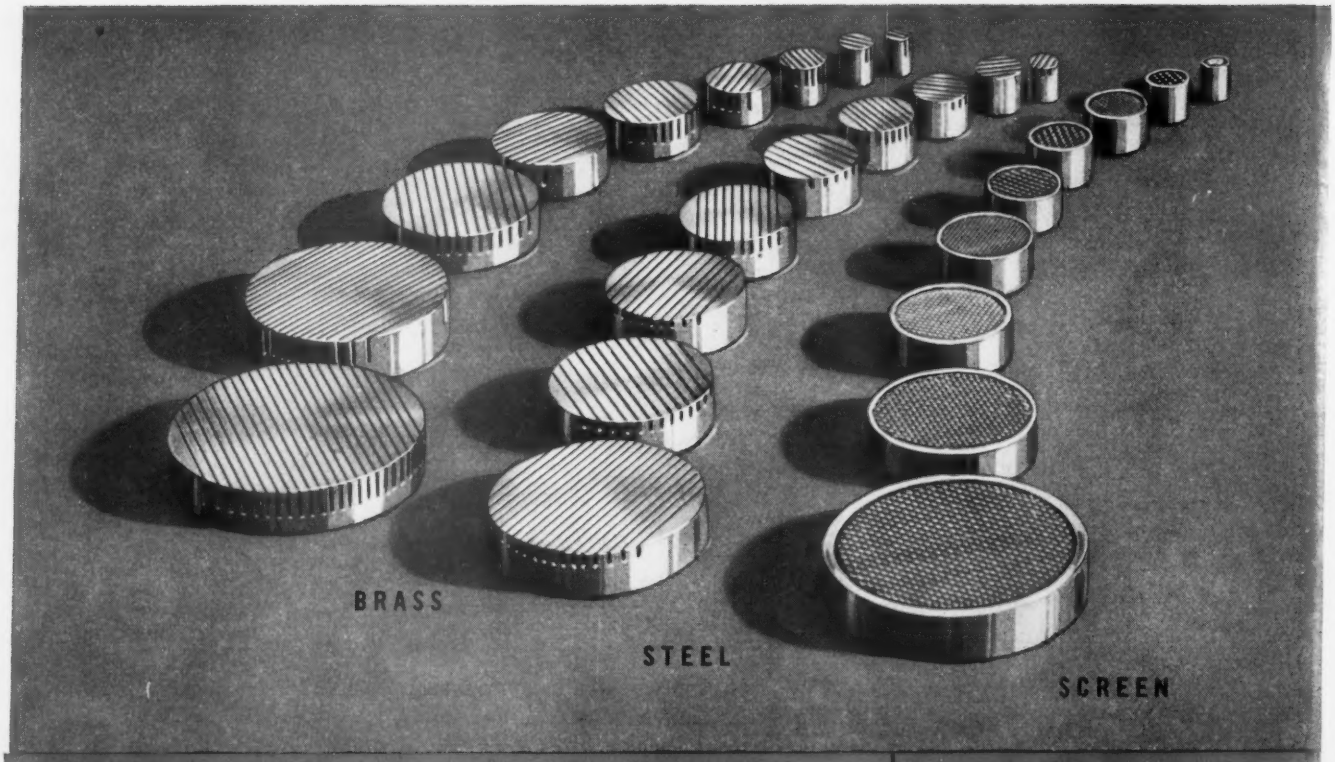

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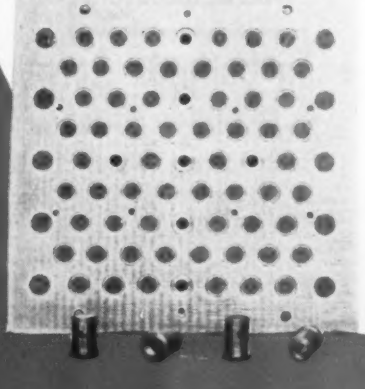
You eliminate all guesswork when you use precision made DEMMLER Core Box Vents. These high-quality vents adhere precisely to specifications because they are precision built to close tolerances. In addition, DEMMLER core box vents possess great rigidity — are truly designed for practical foundry application.

Dependable, efficient, long-lived DEMMLER core box vents are available in brass slotted, steel slotted and screen types. Each of these types offer a wide variety of sizes to meet every application.

Always specify DEMMLER core box vents — you can count on them for quality far above ordinary standards.



UNIVERSAL BLOW PLATE

DEMMLER Universal Blow Plate consists of two plates with separators between, allowing the air from the core box to escape between the plates. The blow tubes and vent bushings are interchangeable so any hole in these plates can be used either as a blow hole or a vent. These plates are recommended for use only on open top, or half core boxes. They are manufactured in any size to suit the bottom dimension of the sand magazine.

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Manufacturers of Core Blowers Exclusively Since 1911

SPECIFICATIONS

BRASS SLOTTED CORE BOX VENTS

Slot Widths: .010", .013", .015"

Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

The brass slotted vents have thick heads, so that they may be used in round or curved core box surfaces, and the heads scraped to conform to the contour of the box. Very fine sand requires the use of vents with .010" slots, but .015" slots may be used, with the usual lake sand core mixtures.

STEEL SLOTTED CORE BOX VENTS

Slot Widths: .010", .013", .015"

Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

The steel slotted vents have thin heads, to make them easy to keep clean, and are preferable for use in flat surfaces of core boxes. They are hard chrome plated to prevent rust.

SCREEN TYPE CORE BOX VENTS

Mesh: #30, #40, #50

Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2"

Screen type vents provide maximum ventilation, and are preferred by many of our customers for this reason. Coarse screen vents may be used in core prints, where it does not matter if the vent leaves a slight mark on the core. They are also useful in vented plates used under core boxes which are open at the bottom.

(*Continued from page* 196)
casting in the most economical manner.

7. Machining or absence thereof on the final casting. Then follows a list of general types of pattern equipment. The paper contains useful indications on the preparation and methods of use of the various types of patterns.

A description of the "Production of Heavy Castings for Electrical Generating Equipment" was given in a paper by N. Charlton, chief metallurgist, foundry division, C. A. Parsons & Co. Ltd., Newcastle-upon-Tyne. The example chosen is a 100,000-kw turbogenerator. Although iron castings are not used for the particular sections subjected to the high pressure of 850 psi and the temperature of 900° F of the steam, it is apparent that where they are used, the service conditions are severe, and the castings must withstand them. Total weight of castings in this machine is of the order of 190 tons; they range from a few pounds to the largest single item, the exhaust section, of approximately 26 tons. For the heavy castings a sandslinger is used to back up with sand the loam facing applied to the pattern. In regard to pattern equipment, the well known method of "casting two in a box" is used. Silicon carbide blocks are used for their chilling effect in certain parts of the mold; this process has been developed by R. H. Smith and C. A. Parsons & Co. Ltd. Many interesting details are given in the paper.

Work Under Difficulties

A paper of a similar type was by C. W. Stewart, Charles W. Taylor & Son Ltd., which describes the "Manufacture of Propellers and Other Castings." The plant in which the propellers were made is over 60 years old; it suffered badly from the prewar depressions, and has limited space and capital resources. By installing cranes of great capacity, this foundry manages to make castings up to 35 tons in weight, and the author pays tribute to the craftsmen of the region who, under difficult conditions, enable castings to be turned out which compare favorably with those made in more modern foundries.

G. W. Nicholls and D. T. Kershaw, respectively manager and chief chemist, Modern Foundries Ltd., Halifax, contributed a paper in which they described a "System of Studying Casting Defects." This system is based on thorough control of all defective work throughout the foundry and a complete set of records. Three main purposes are aimed at: (1) To study and eliminate defective castings; (2) to prevent defective castings arriving at the machine shops; (3) to supply the foundry with complete details of all defective work in the form of record cards and instruction sheets. Account is taken of all operations, including design, camber, molding, coremaking, composition of the metal, etc.

One session was devoted to aluminum alloys. D. C. G. Lees, metallurgist, Aluminium Development Association, London, presented a paper on behalf of the British Non-Ferrous Metals Research Association on "Casting Characteristics of Some Aluminium Alloys." Sixteen different alloys were investigated and the results obtained made it possible to outline their casting properties and other factors influencing the ease with which the alloys are handled in the foundry. The investigation covered: Susceptibility to hot-tearing; effect of internal shrinkage porosity on mechanical properties; pressure tightness when feeding is restricted; ease of handling alloys in the foundry. The authors remark that alloys with a

(*Continued on page* 202)

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MODERN
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HERE'S REAL PRODUCTION EFFICIENCY!
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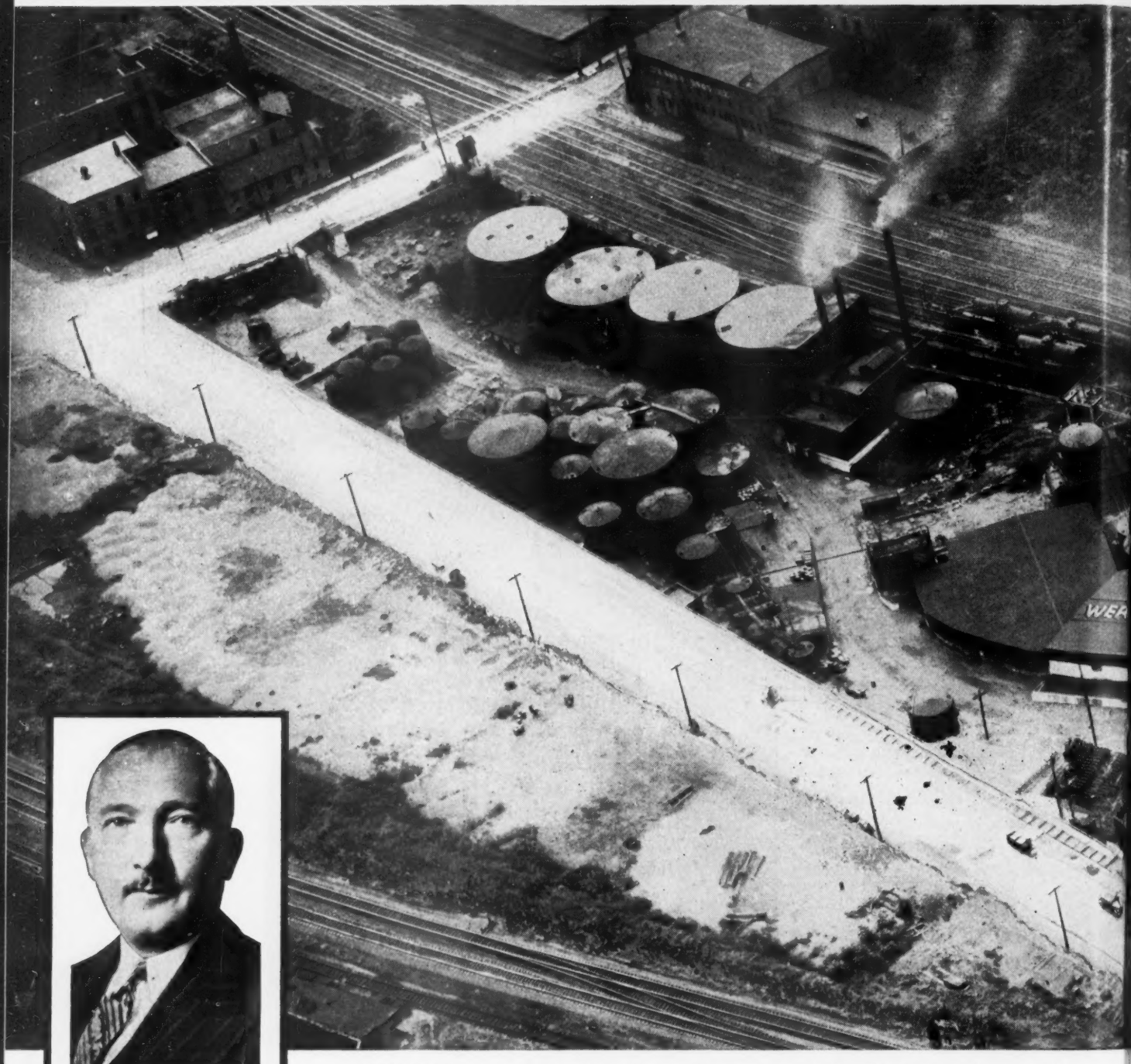

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(*Continued from page* 199)

low liquidus temperature and not adversely affected by a high pouring temperature can be given sufficient superheat to impart high fluidity.

"D.T.D.424—The Versatile Light Alloy," by A. P. Fenn, Aluminium Development Association, was intended to show that the Al-Cu-Si alloy under consideration, while having in general been used since 1939 in the as-cast condition as a general purpose material for castings which are only slightly stressed, is actually capable of giving much greater service in the engineering field. By various heat treatments, a considerable range of mechanical properties can be obtained. The alloy is equally suitable for casting by sand, gravity die casting and pressure die casting.

Third paper of this series was "Production and Properties of Aluminium Casting Alloys," by F. H. Smith, development officer, Association of Light Alloy Refiners, Ltd., in which the author reviews the development of aluminum alloys, the raw materials from which the alloys are obtained, the preparation and treatment of scrap material used for remelting, casting procedure and inspection. The author also offers a classification of aluminum alloys now in use.

Investigate Dust Problem

Two papers covered the subject of "Dust" in foundry operations. One, by W. A. Bloor, from the Steel Castings division of the British Iron and Steel Research Association, dealt with "Reduction of Dust in Steelfoundry Operations." The BISRA, through its foundry hygiene project, has conducted work on this matter in conjunction with the work of the Factory department and the Medical Research Council. Methods have been developed for measuring and continuously recording dust concentrations, and these methods have been used in foundries to explore the source, composition and concentration of dust. Dust concentrations have been shown to vary widely between foundries, and from operation to operation, and the importance of isolating dusty operations and removing the dust at its source have been clearly demonstrated. Among the conclusions is that dust concentrations appear to decrease with both increasing floor area per worker and with average weight of casting produced.

The other paper on dust control was "Observation and Control of Dust in Foundry Dressing Operations." This was divided into two parts: Control of Dust, by R. F. Ottignon, development and foundry director, K. & L.

(*Continued on page* 204)

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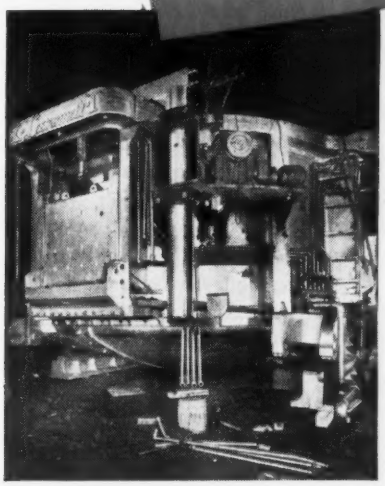
...AND BUILD 'EM COMPLETE



WE BUILD 'EM COMPLETE: For example, even the piping is assembled and tested before shipment.

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Lectromelt builds 'em complete. Your Lectromelt furnace is assembled and operated mechanically in *our* plant. So it gets put together faster in *your* plant. You gain production time.

Lectromelt builds 'em with all these features: top-charging design that speeds production, cuts electrode consumption, saves power, lengthens lining life; counterbalanced electrode arms; engineered power supply and regulating apparatus designed to take punishing overloads; oil-bearing-mounted top structure; side-mounted tilting mechanism. Features that enable us to say—we build 'em big; we build 'em complete—and we have mighty few calls for replacement parts. Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.

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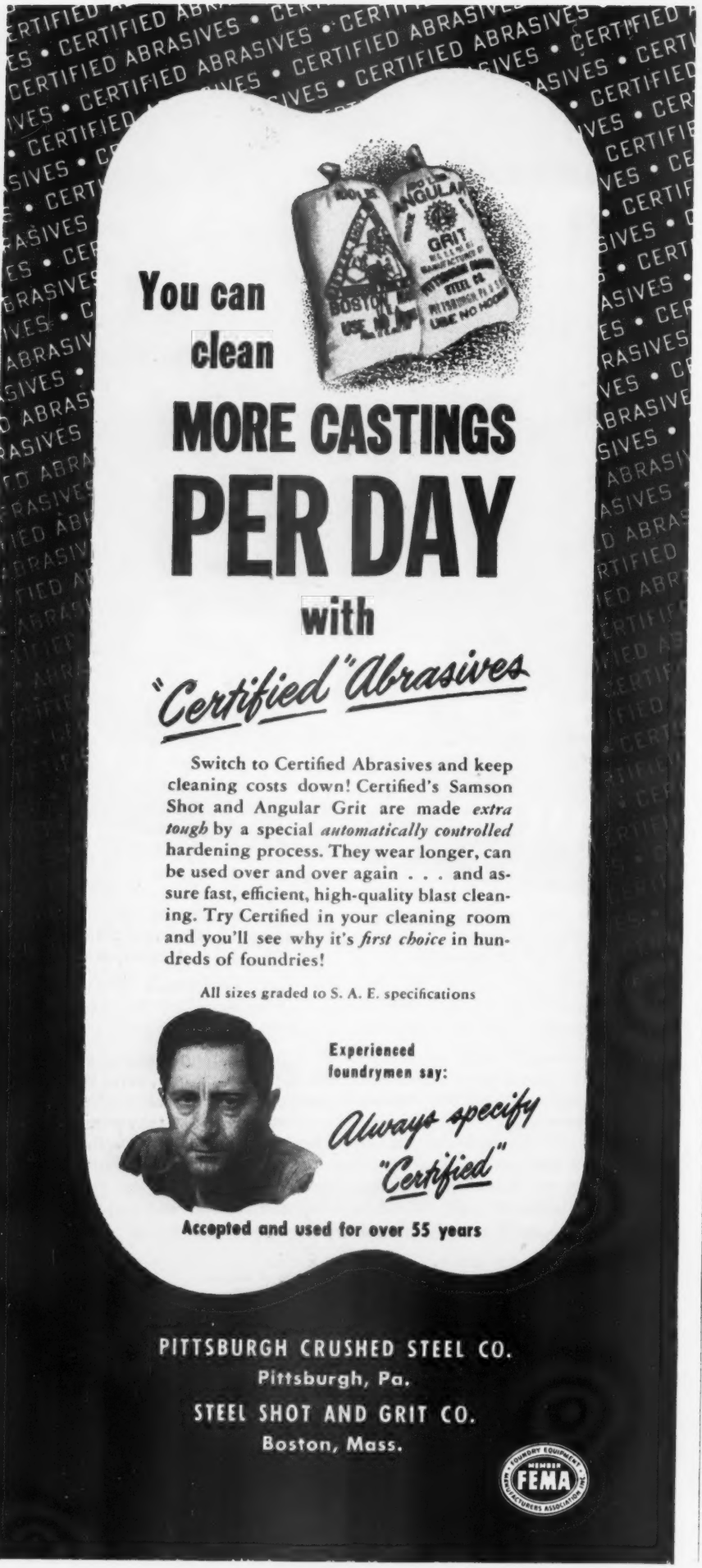
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Switch to Certified Abrasives and keep cleaning costs down! Certified's Samson Shot and Angular Grit are made extra tough by a special automatically controlled hardening process. They wear longer, can be used over and over again . . . and assure fast, efficient, high-quality blast cleaning. Try Certified in your cleaning room and you'll see why it's first choice in hundreds of foundries!
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(*Continued from page* 202)

Steelfounders & Engineers Ltd., Letchworth; and Observation of Dust, by W. B. Lawrie, H. M. Engineering Inspector, Factory department, ministry of Labour and National Service. Two aspects of the problem were dealt with: (a) a new approach to methods of local exhaust ventilation which would give both greater production and lower capital and running costs than the more conventional methods is use, and (b) the provision of some means of observing progress.

Compare Methods

The work dealt with the application of local exhaust ventilation to the dressing of small and medium size castings, and two dressing benches were constructed. One was fitted with local ventilation only, while the other, more successful bench, was provided with local ventilation assisted by an air jet which imparted to the dust a movement in the required direction. Existing methods of dust estimation indicate the amount of dust present at a particular time and at a specified point in space. Recording of the actual movement of the dust was done by a macroscopic observation of the dust cloud under conditions similar to those used in the application of the Tyndall phenomenon to the ultra microscope. Cinematograph films were taken to show the clouds observed at different processes both with and without local exhaust ventilation. Results indicate that increased efficiency in local exhaust ventilation may well be attained by using an air jet to control the direction in which a dust cloud flows. It also appears that further aerodynamic studies are essential to effective local exhaust ventilation.

A survey of methods used and principles involved in "Mechanical Charging of Cupolas" was given by W. J. Driscoll, British Cast Iron Research Association, in which the author summarized the various methods used to reduce the manual effort in charging cupolas and handling and weighing charge material. The relative merits of different types of equipment, including American methods, in conjunction with conditions existing in different foundries, were discussed.

A report from Subcommittee T.S. 20 of the Technical Council of the Institute dealt with "Evaluation of Soundness in Cast Iron." Chairman of the subcommittee was A. Tipper, and the terms of reference were: To examine and recommend methods of evaluating soundness in cast iron with a view to the use of such methods in

(*Continued on page* 206)

Partners in Production

Adams 12"-38"
Jolt Squeezer
Portable Type

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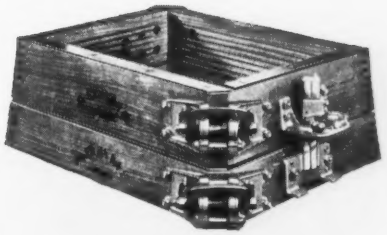
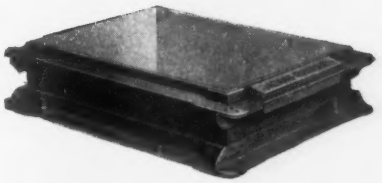
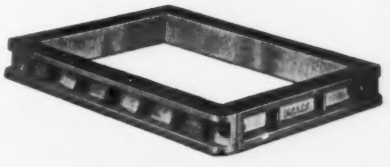
MOLDING MACHINES and CUSTOM-BUILT FLASK EQUIPMENT







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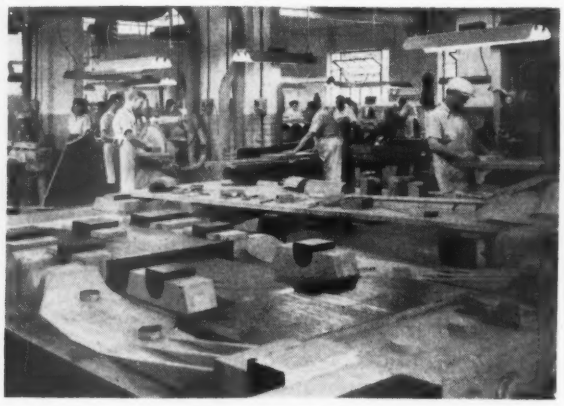

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THE WELLMAN BRONZE & ALUMINUM CO.

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(*Continued from page* 204)

subsequent investigations on the effect of mold materials on gray and malleable iron castings." The committee interpreted unsoundness as including all forms of internal porosity, inclusions and gas holes. They dealt mainly with nondestructive methods of testing.

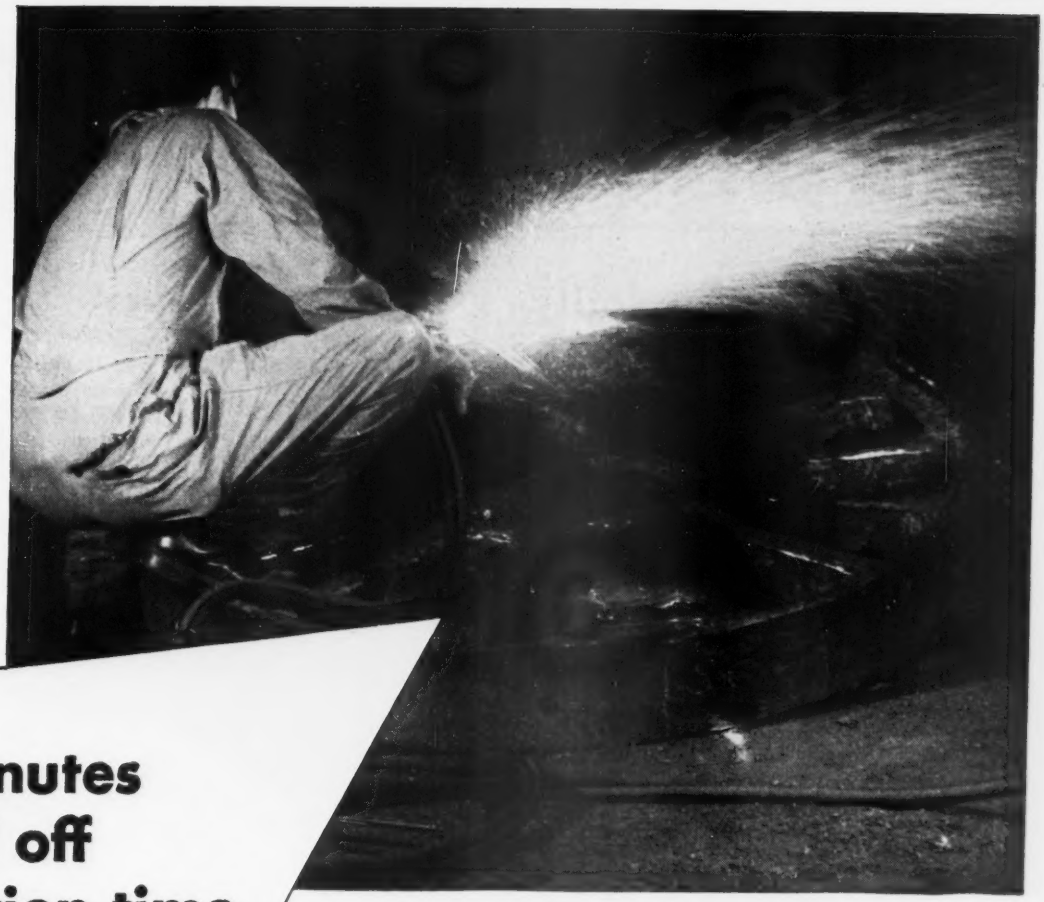
The main conclusions of the report are: That, for the precise location and delineation of any form of unsoundness which produces a local variation in opacity to gamma or x-rays, radiography can be recommended, although limitations are imposed by section thickness and possible evenly distributed porosity of small size in gray cast iron. The principal advantage of ultrasonic methods lies in their application to thick sections beyond the range of x-rays. Electrical and magnetic methods proved of limited value, except to distinguish between sound and unsound test pieces of simple geometrical form. The determination of relative density is of limited value.

Observe Safety Precautions

G. M. Michie, Research and Development division of the British Steel Founders Association, contributed a "Review of Present-day Steelfoundry Radiographic Practice." Attention is particularly directed toward the availability of artificially prepared radioactive isotopes, which materials, together with x-rays, radium and radon are now in general use in many steel foundries. Emphasis is placed on safety precautions which must be observed in practice. Safe working distances from various gamma-ray sources are diagrammatically indicated. The view is expressed that the more general application of radiographic methods now made possible through the availability of cheap radioactive isotopes, constitutes a major step toward the extended application of steel castings in many fields of engineering practice.

"Heat Treatment of Gray Cast Iron" was the subject of a report by Subcommittee T.S. 31 of the Technical Council of the Institute. Under the chairmanship of T. R. Twigger, this subcommittee had for its terms of reference: "To consider and report upon the subject of heat treatment of gray cast iron, with particular reference to sectionalizing the problems involved, and to make recommendations regarding the order in which they should be investigated." The subcommittee was asked to conclude its survey as quickly as could conveniently be done, so that the Technical Council might consider the ad-

(*Concluded on page* 209)



150 minutes slashed off production time

Formerly, the Pittsburgh Steel Foundry Co. removed sixty-pound riser pads from cast steel locomotive drive wheels by grinding . . . a slow, laborious procedure that took 3 hours per wheel.

Now, using Airco's modern flame scarfing technique, similar riser pads are removed in thirty minutes; thus 150 minutes of grinding time per wheel are eliminated, castings are ready for finish machining.

This is another example of the manner in which Airco modern oxyacetylene and electric arc methods are helping progressive foundry operators slash production time and costs.

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An extra quality, exceptionally rugged hose for toughest use on air drill and pneumatic service in mines, quarries and construction jobs. Non-porous tube resists heat and oil. High tensile cotton yarn braid reinforce carcass. Tough grey cover resists cutting, gouging, abrasion. Made in ½" 2-braid and ¾" 2-braid sizes. 200 to 300 lbs. working pressure. Maximum length 50'.
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For heavy construction work in mines, quarries, tunnels and wherever large size hose is required for long service. Smooth black tube resists heat and oil. Carcass of strong, rubber-impregnated multiple ply woven duck. Rugged, heavy-gauge red rubber cover resists severe weather extremes, cutting, abrasion. 9 sizes stocked from ½" to 4". Working pressures from 175 to 225 lbs. Maximum length 50'.
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AUROCHS AIR
For portable air compressors, jackhammers, rugged industrial and construction work. Smooth, black, non-porous tube resists heat and oil. Carcass: multiple ply, rubber-impregnated, rugged woven fabric. Tough black cover resists weather and abrasion. Stocked sizes: ½", ¾", 1". 200 lbs. working pressure. Maximum length 50'.
VIM AIR
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For general industrial use, on compressors and pneumatic tools. Black tube resists oil and heat. Husky cotton yarn braids. Smooth, red cover resists weather, abrasion. 8 sizes stocked, ¼" 2-braid to 1" 3-braid. Working pressures 150 to 225 lbs. Maximum length 500'.
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For a variety of jobs including handling of air, water, oil, gasoline, kerosene (not for paints, lacquers, lacquer-solvents). Black, synthetic tube resists oil and heat. Carcass is braided rayon cord, high strength, super flexible. Smooth, brown, tough synthetic cover resists oil, abrasion, sunlight. 11 sizes stocked from 3/16" one-braid to 1" 2-braid. Working pressures: 200 to 300 lbs. Maximum length approximately 500'.
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(*Concluded from page* 206)

visability of appointing one or more subcommittees to study in greater detail any recommendations the subcommittee might make. Thus, the report was, necessarily, a review of available literature and the experience of members of the subcommittee, and it contains no results of new research work. In its recommendations, the subcommittee suggested further investigation on these points:

1. While there is a large volume of information on the question of pearlite breakdown in normal irons, there is little available information on the response of unusual compositions and specially modern alloyed irons containing nickel, chromium, copper, molybdenum, either singly or in combination. The effect of graphite size and distribution as cast, also of section thickness, could also usefully be studied.

2. The removal of massive free carbides in iron accidentally chilled, where the composition is unusual by reason of very low or very high silicon, unbalanced sulphur, or the presence of nickel, chromium, copper, molybdenum, either singly or in combination.

3. The influence of the rate of cooling through the critical point on the residual combined carbon of irons heat treated at temperatures above the critical is not at all clear and could usefully be investigated in relation to the chemical composition.

Book Review

Symposium on the Role of Non-Destructive Testing in the Economics of Production, paper, 158 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $2.50.

Aimed at capturing the attention of management the six papers in this symposium, held at the 1950 annual meeting of the society, are intended to present unbiased views explaining the actual and potential values of the various well recognized methods of nondestructive testing in promoting higher quality or more economical production.

Papers include "Role of Non-destructive Testing in the Economics of Castings"; "Discontinuities in Cast and Wrought Products that Can be Revealed by Non-destructive Tests"; "Basic Guide for Management's Choice of Non-destructive Tests"; "Economics and Practical Application of Cobalt 60 in Radiographic Inspection of Steel Weldments"; "Economics of Wrought Steel Inspection"; and "Management's Responsibility for Insistence on Non-destructive Testing in Development of New Engineering Products and Processes".

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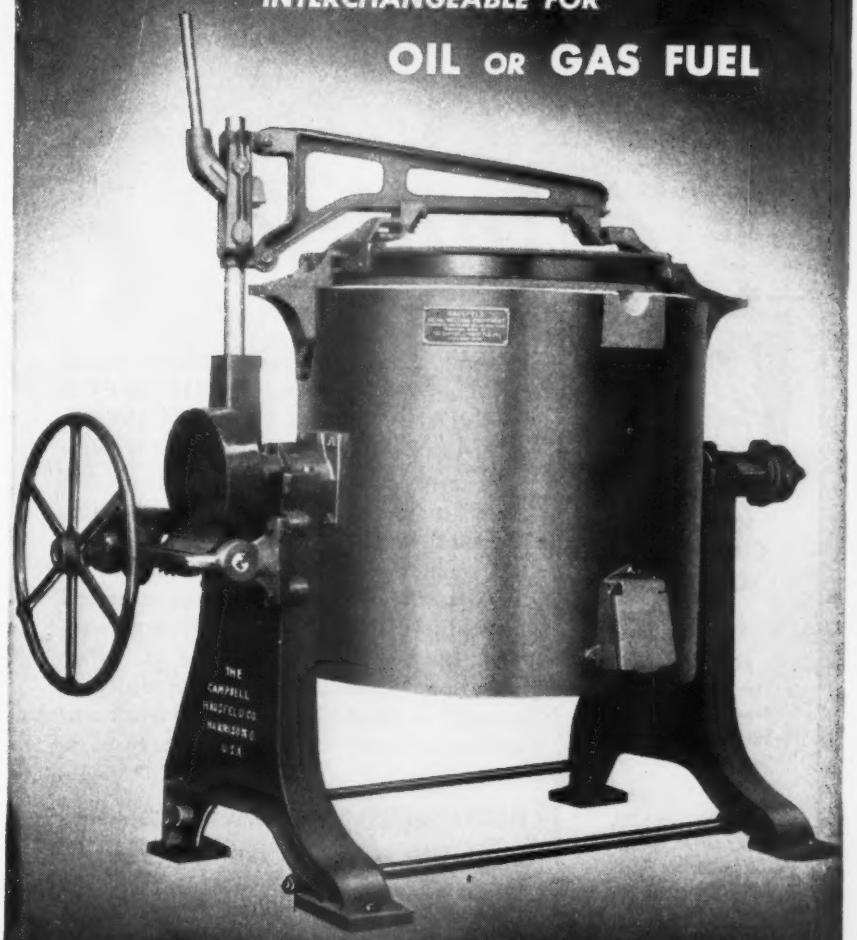

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45% gain in Electro malleable iron HIGH SPEED grinding

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In actual production tests under identical conditions, Electro HIGH SPEED GRINDING WHEELS removed 153 lbs. of metal while competitive wheels averaged only 105 lbs. In grinding from 24" to 20" diameter, Electro removed 6.8 lbs. of metal per cubic inch of wheel and 10.4 lbs. per hour. • This greater efficiency in Electro wheels when grinding annealed malleable castings will hold comparably with Electro Cutting-Off and all other wheels. • All we ask is opportunity to prove it in your plant, on your work and without obligation. Write, phone or wire.

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Alloy Casting Institute Picks Officers

Warden F. Wilson, general sales manager, Lebanon Steel Foundry, Lebanon, Pa., has been elected president of the Alloy Casting Institute, national technical organization of leading producers of stainless steel castings.

Other officers, elected at the institute's annual meeting at Hot Springs, Va., are: Vice president, H. T. Harrison, vice president, the Duraloy Co., Scottdale, Pa., and E. A. Schoefer, who was re-elected as executive secretary and treasurer. G. A. Baker, vice president, the Duriron Co., Inc., Dayton, O., and J. S. Wooters, General Alloys Co., Boston, were elected to three-year terms as members of the board of directors.

Mr. Wilson, who served as a director of the institute prior to his election as president, for a number of

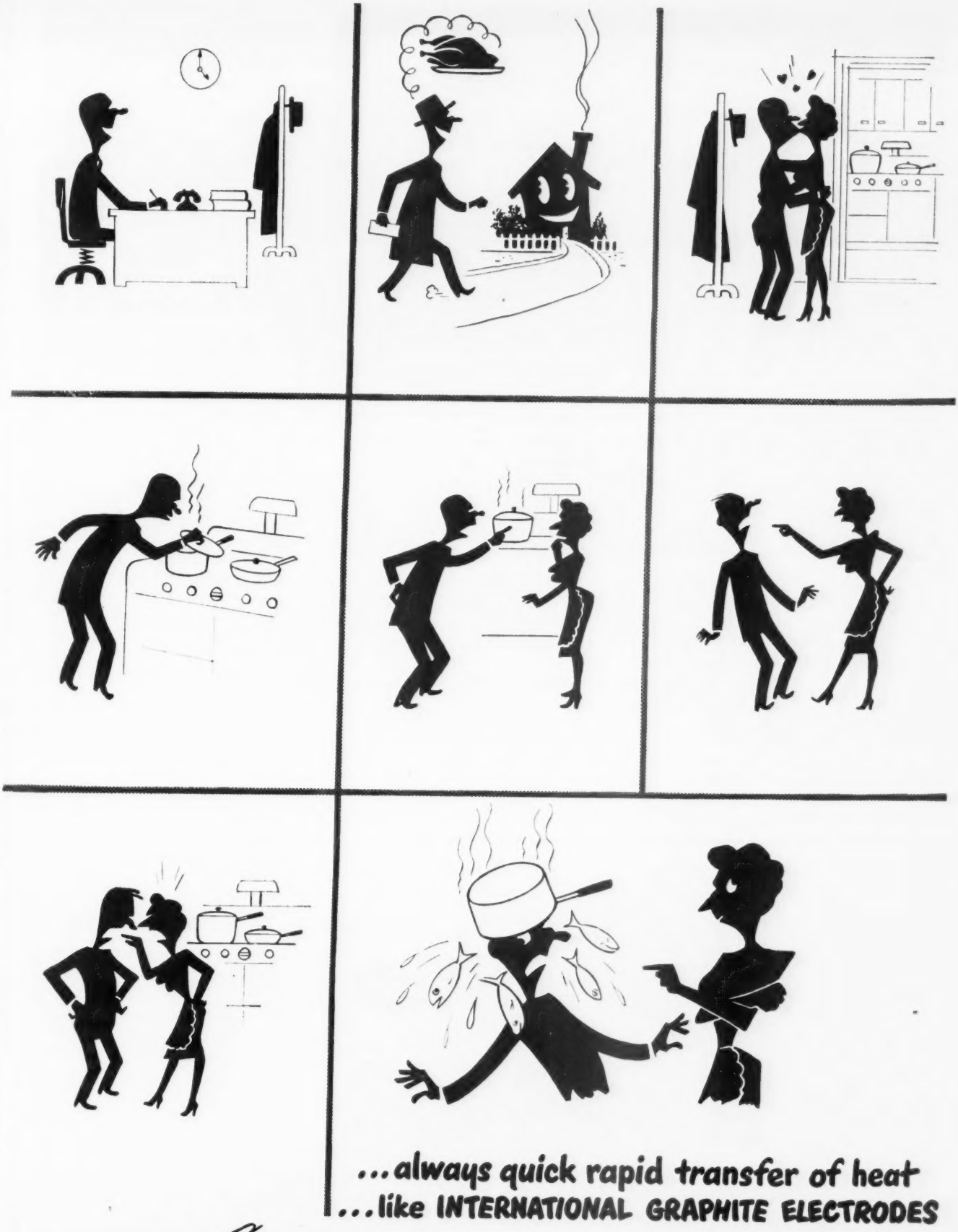
WARDEN F. WILSON

years has been active in the institution of intensive research and product development undertakings of the industry. Recipient of two engineering degrees from the University of Illinois, he entered the employment of American Steel Foundries in 1925, sucessively advancing to the posts of assistant to the works manager at Indiana Harbor, Ind.; manager of the Pittsburgh Works, and subsequently manager of the Verona Works of American Steel Foundries, before becoming chief sales executive of Lebanon Steel Foundry in 1939.

Also active in steel casting industry affairs, Mr. Wilson is national chairman of the advertising and public relations committee of Steel Founders Society of America.

Alloy Casting Institute, with responsibility for expenditure of more than $500,000 for technical research since its organization in 1933, represents a majority of the nation's

(*Concluded on page* 212)



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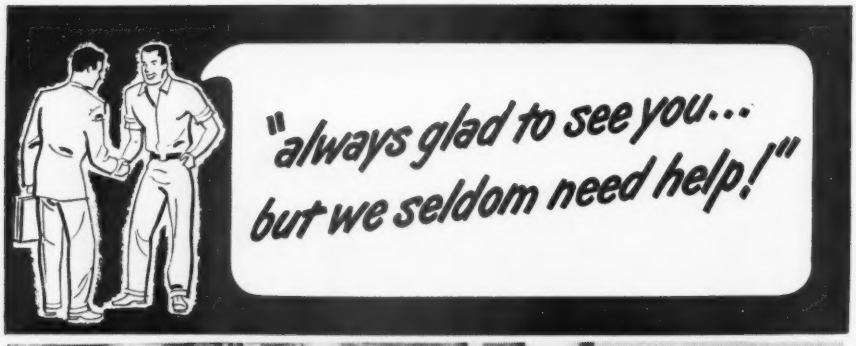

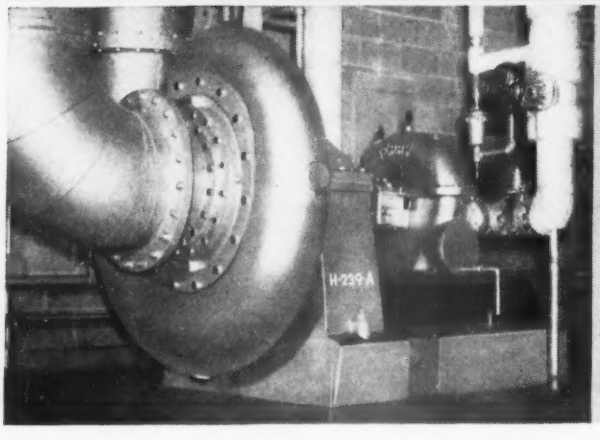

CENTRIFUGAL

Type OIB Centrifugal Blower used for processing in a large eastern plant. Capacity 12,000 cfm. Similar R-C Blowers are utilized in other plants of this company.

The works manager of a large plant made this friendly statement to a Roots-Connersville representative. What he really meant was that R-C Blowers and related equipment perform so satisfactorily and dependably that they seldom need anything more than routine inspection by his own men.

In large and small plants, in every industry, R-C products uniformly give this kind of reliable operation. They continue to deliver rated capacities, year after year, with a minimum of maintenance—whether a small Rotary Positive Blower of 5 cfm capacity or a Centrifugal unit moving up to 100,000 cfm. And remember, only Roots-Connersville gives you this important dual-choice.

If you are planning a new plant, expansion, or replacements, R-C engineers will work with you to select the equipment best fitted to your needs. Almost a century of experience is at your service.

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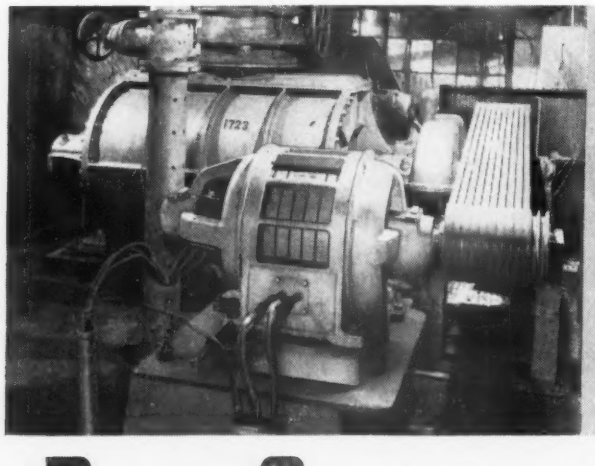


ROTARY

After 20 years of continuous foundry cupola service, an old R-C Blower was released for intermittent service and replaced with this modern, Type RCS Rotary Positive unit, with capacity of 10,200 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS R-C SINCE 1854

ONE OF THE DRESSER INDUSTRIES

(*Concluded from page 210*)

principal manufacturers of high alloy castings. The numerous continuing research undertakings carried out under its auspices have resulted in many noteworthy developments in the production of heat- and corrosion-resistant castings widely used in the metals-treating, chemical, and many other basic industries. Headquarters of the Institute are at 32 Third Ave., Mineola, N. Y.

Cornell University Plans New Laboratory Facilities

A number of gifts totalling $1,175,000 toward a $1,736,000 materials testing and processing laboratory have been accumulated by Cornell University, Ithaca, N. Y. An alumni committee has been formed under the chairmanship of Walker L. Cisler, Detroit Edison Co., Detroit, to seek additional funds.

Construction of the engineering units began in March. They will be named for Dr. Robert H. Thurston, first president of the American Society of Mechanical Engineers, who was director of mechanical engineering at Cornell from 1885 to 1903, and Dexter S. Kimball, professor emeritus, who was the first dean of the university's College of Engineering.

Thurston Hall will have facilities for work in problems of stresses and the testing of engineering materials and structures. Kimball Hall will contain machine shops and equipment for teaching and research in tool design, plant layout and organization, production techniques and time and motion study.

Book Review

1950 *Supplement, Book of ASTM Standards, Part 5, Textiles, Soap, Fuels, Petroleum, Aromatic Hydrocarbons, Antifreezes, Water,* paper, 579 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $3.50.

This supplement contains 34 standards replacing existing ones in the 1949 *Book of ASTM Standards* as well as one published for the first time. It also includes 26 tentatives as replacements and 40 appearing for the first time. Yellow stickers accompany the supplement for attachment in the proper place in the 1949 book to direct attention to standards which have been superseded or have minor revisions, to tentatives which have been adopted as standards without revision, and to standards and tentatives which have been withdrawn.

USE THE CORE OIL TAILORED TO YOUR CORE ROOM REQUIREMENTS

DELCO 30 SERIES CORE OILS HELP YOU TURN OUT BETTER CORES— CHEAPER— FASTER

That's right Mr. Foundryman—"better, cheaper, faster." And here's HOW. Cities Service Company has developed a Delco 30 Series core oil for your every core room requirement... a core oil you can depend on for superior performance at lower than average cost.

Here's what leading foundrymen report—

- "The big difference is in saving time and fuel in the oven, by cutting down both time and temperature—with no sacrifice of results in the finished core."
- "Results indicated 30 Series Delco Core Oil best suited our general overall work."
- "Best Core Oil I ever used!"
- "We are using one-fifth less oil, and the baking time in the ovens has been reduced approximately two hours."

No matter what type or size cores you make, whether your production is large or small there is a Delco Series Core Oil tailored for the job. Call in a Cities Service representative and ask him to assist you in selecting and applying the correct grade of Delco Core Oil for your specific needs. This service is prompt, reliable, valuable and free. Cities Service Oil Company, Chicago, Cleveland, Kansas City, St. Paul and Toronto; Arkansas Fuel Oil Company, Shreveport.

Features of Cities Service 30 Series Core Oil that are building preference throughout the industry.

BETTER PERFORMANCE in core boxes, whether blown or hand rammed, whether sand is washed and dried or crude.

FASTER DRYING TIME without recourse to older types of drying oils.

WIDE RANGE OF WORKING TEMPERATURE—ready for use without pre-conditioning, whether in Texas or Montreal.

BAKES OUT AT LOWER TEMPERATURE, saves time, oven capacity and fuel.

HAS A CLEAN, PLEASANT ODOR.

MADE IN FIVE QUALITY RANGES accommodating all local foundry and core room conditions.

DELCO CORE OILS • ROSINAL LIQUID CORE BINDER • DELCO CORE AND MOLD WASH

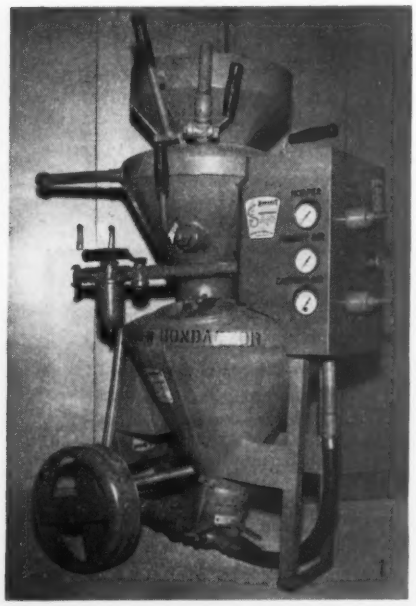
CITIES SERVICE

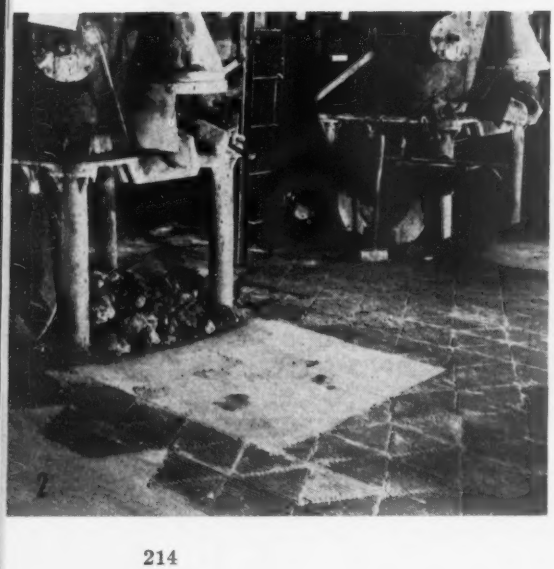
New EQUIPMENT *and Supplies*

For Additional Information on these Items Use Reply Card—Page 217

(1)—Refractory Ramming: Eastern Clay Products Inc., Jackson, O.—Redesigned machine for air placement of refractory patching materials has increased hopper capacity for the refractory being applied. Improved control of the pressure makes possible more exact control over moisture content of the patch, resulting in a more uniform and durable lining. A new control panel groups the necessary gages to make operation as simple as possible. The machine is said to be especially effective for patching cupolas and for open and mixing ladles.

For More Details Circle No. 1—Page 217





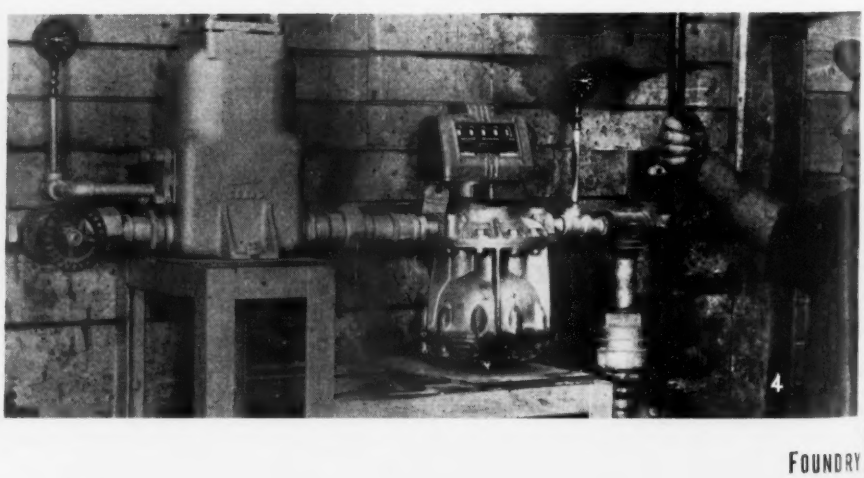
(2)—Floor Material: Walter Maguire Co., 60 East 42nd St., New York 17—Emery aggregate-cement mixture is said to produce nonskid floors of high toughness and durability. It resists oils, most acids, constant moisture, and steam, and is claimed to be unaffected by intense heat from molten metal and radiant heat of furnaces. Tests indicate that floors of this material hold up under loads of 14,500 psi. The material can be used for new floors, resurfacing old floors, or for less extensive repairs to old floors. It is equally serviceable in indoor or outdoor installations.

For More Details Circle No. 2—Page 217

(3)—Spindle Sander: Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11—Spindle sander and grinder for wood, metal and plastics features a tilting spindle rather than a tilting table. Spindle can be used oscillating or nonoscillating and can be tilted from zero to 45 degrees by a worm and gear unit, and locked in place at any desired position. Other features include a lighted periscope for easy reading of accurate settings; a 2-hp, constant-speed motor, with choice of 2000 and 4000 rpm; adaptability of abrasive sleeves from ¼-in. to 4-in. in diam., and 6 to 11 in. long; also grinding wheels up to 5 in. in diam and 5 in. high. A built-in safety device prevents use of the high speed with large diameter units. A corebox attachment produces straight and tapered coreboxes mechanically, eliminating handwork and reducing the time involved.

For More Details Circle No. 3—Page 217

(4)—Meters: Bowser Inc., 1302 East Creighton Ave., Ft. Wayne 2, Ind.—The use of meters for measuring core oil and water in formulating



core sand mixtures is said to effect material and labor savings and to produce more uniform and higher quality cores. Company estimates that a foundry consuming 100 drums of core oil a year could save $400 annually by reducing losses caused by oxidation, faucet dripping, spillage and other avoidable losses, through use of metering systems. An additional $100 in labor savings also is claimed. Barrel draining, pumping and metering equipment includes an evaporation-proof tank with barrel track and gravity drum draining accessories, hand or electric pumps, and a meter calibrated in gallons and tenths, pints, or pounds. Larger systems are offered for foundries using tank car loads of core oil. Such installations usually include a meter for checking tank car receipts. Meters also are available for measuring water added to core sand mixes.

For More Details Circle No. 4—Page 217

Wet Blaster: Cro-Plate Co., 747 Windsor St., Hartford 5, Conn.—Self-contained wet blasting unit is designed for high speed, accurate deburring, descaling, stock removal, and general surface finishing. The unit directs abrasive slurry against the work accurately and at high speed as illustrated by the fact that a 3/16-in. diam hole can be bored in a piece of ½-in. thick plate glass in 38 seconds. Blaster operates on compressed air at shop pressures of 80 to 120 psi. Work to be finished is inserted in the 30 x 30 in. cabinet through front hand holes or side doors. Both entrances are fitted with splash-proof guards. Mechanical, knee actuated valves and controls are located at the front of the cabinet, and a large viewing window enables operator to watch progress of the work. Installation requires a ½-in. water connection and a ½-in. air connection.

For More Details Circle No. 5—Page 217

Cathodic Etcher: Distillation Products Industries, Vacuum Equipment, 755 Ridge Rd. West, Rochester 3, N. Y.—High vacuum equipment for cathodic etching used in studying grain structure of metals, bombards the metal sample with a glow discharge at certain low pressures. Unit is expected to be particularly useful for studying cold flow lines. The glow discharge which "etches" the metal surface is produced by positive ions passing between an aluminum anode and the sample of metal to be studied. Etching is produced physically and there is said to be little danger of forming oxides and other chemical artifacts. Under the bombardment of ions the grain boundaries in metals are attacked at a different rate from the main bodies of the metal crystals, thus in many cases bringing out the crystal shapes and other characteristics of the metal with good clarity, it is claimed.

For More Details Circle No. 6—Page 217

Dehumidifier: Carrier Corp., 302 South Geddes St., Syracuse, N. Y.—Dehumidification unit weighs 60 lb and is fitted with casters and handholds for portability. It operates on a standard 115 v circuit and is equipped with ⅛-hp motor. Under conditions of 80°F and 70 per cent relative humidity, it is said to be capable of removing 18 pints of water from the air in an average space every 24 hr. Unit is enclosed in a flat-topped, rectangular cabinet, 23½ in. high, 17½ in. long, and 13½ in. wide, with a baked hammertone enamel finish. Condensed moisture can be disposed of through the nearest drain by attaching a piece of rubber tubing to the drip pan spout. A removable condensate pail also is provided with the unit.

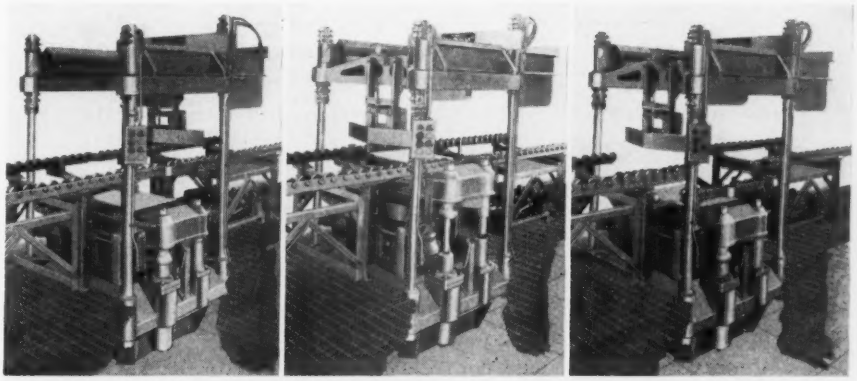
For More Details Circle No. 7—Page 217

Shop Crane: Allied Mfg. & Sales Co., 3101 West Grand Ave., Chicago 22—Portable shop crane features a hydraulically adjustable center post which provides a wide range of lifting heights to suit a number of lifting jobs. The hydraulic mechanism is hand operated and provides simple and positive control. A winch is provided to raise the load; seven turns on winch handle raises load 1 ft. Crane is mounted on 8-in. roller bearing wheels for portability and has a lift of 9 ft, 8 in. with maximum lifting capacity of 5000 lb. It is claimed that one man can hoist and move a maximum load.

For More Details Circle No. 8—Page 217

Release Agent: Dow Corning Corp., Midland, Mich.—An emulsion containing silicone has been developed as a parting material for the pattern and mold in the shell molding process. The silicone content of the emulsion is in the nature of a viscous, nonmelting grease. Films deposited from the emulsion form a tenacious coating which is said to re-

Push-button Machine Makes Molds Automatically

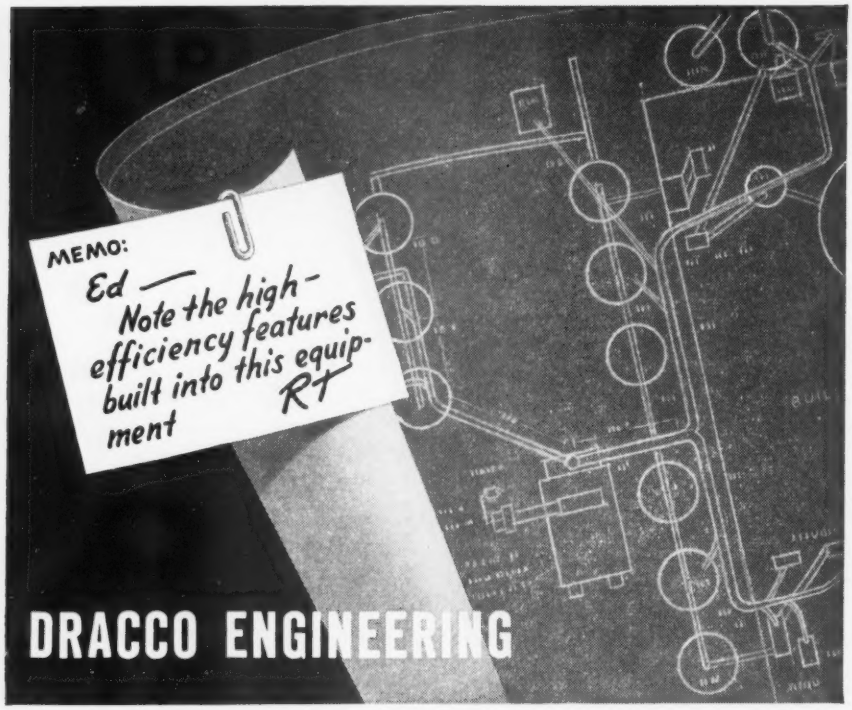


PUSH-BUTTON, automatically operated molding machine, designed to produce a half-mold every 29 seconds (including 5 seconds to fill the flask), has been developed by Wm. H. Nicholls Co., Richmond Hill, N. Y. Machine is run by two operators. A push button starts the jolting operation, which ceases when a predetermined number of jolts has been completed. For the squeezing operation, both operators must engage both hands in holding push buttons to bring squeeze car into position for squeezing and strikingoff the mold.

If either operator releases a button before the predetermined time set for the squeezing operation, the machine will stop and the squeeze piston return to normal position ready for restart when the buttons again are pushed. When squeezing is completed the pattern is drawn from the mold on the down stroke of the squeeze piston. At this point, the roller lift engages the flask and raises it to the proper roll-off height. The frame then is lowered and the squeeze car, in returning to the out position, pulls the finished half-mold onto the conveyor. Machine now is in position to receive the next empty flask.

The illustration shows the machine first in jolting position, then in squeezing position, then with the pattern draw completed and in positon to pull the completed mold-half onto the roll-out extension. The unit shown has a 26-in.-diam squeeze piston and 11-in.-diam jolt piston. A larger machine, with squeeze and jolt piston diameters of 36 and 14 in., respectively, draws the piston on the up stroke of the squeeze piston and operates on a total cycle of 30½ seconds.

For More Details Circle No. 9—Page 217

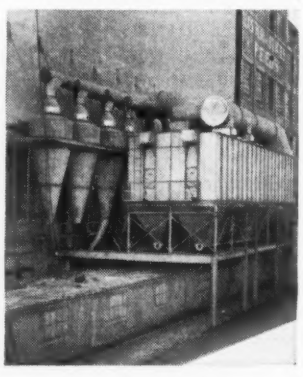


FOR LOWER MAINTENANCE AND PROCESSING COSTS

Most manufacturers recognize the great importance of dust control in reducing processing and maintenance costs in their operations. What they may not realize is that the operating efficiency of dust control systems is determined completely by the engineering "know-how" which builds into these systems all factors vital to high-efficiency operation.

DRACCO engineering and DRACCO DUST CONTROL SYSTEMS have been successfully solving dust control problems for many years—removing hazardous dust in some installations, recovering valuable materials in others—but in all instances providing high efficiency DUST CONTROL SYSTEMS to meet the specific operating requirements of the installation.

When you think of dust control, think of DRACCO—the Name, the engineering skill, and the dust control system that will successfully solve your dust control problems.



DRACCO engineers will gladly provide you with complete data on high-efficiency DRACCO equipment as applied to your specific problem. Simply write to

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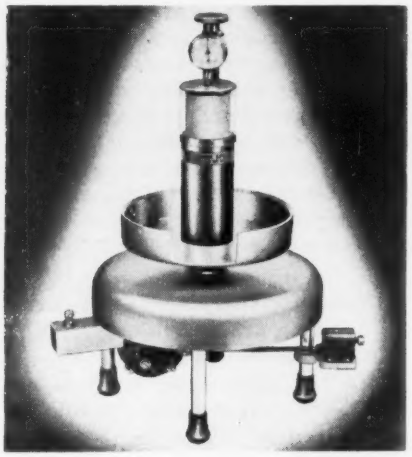
PNEUMATIC CONVEYORS • METAL FABRICATION

duce build up on the pattern to a minimum. It is a concentrated material and should be reduced with water before using. It can be applied to the pattern by spraying or dipping. The emulsion is said to have a silicone content of 40 per cent freezing point of —2°C and to be noncorrosive and nonflammable.

For More Details Circle No. 10—Page 217

Core Tester: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Green core impact tester shows the



ability of a green core to resist slumping and cracking. It is intended to supply supplementary data to strength tests which alone might fail to indicate proper sand performance under usual coreroom conditions. Tester is motorized and equipped with a jolt counter.

For more Details Circle No. 11—Page 217

Vise: Columbian Vise & Mfg. Co., 9017 Bessemer Ave., Cleveland 4—Fast-operating hydraulic vise to hold castings for cleaning has a 3½-in.

jaw width and a 6-in. jaw opening. Maximum gripping pressure between jaws is 6000 psi. A safety valve pro-

(*Continued on page* 220)

IDEAS for FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

50. Refractory Cements

Norton Co. — This well-written booklet, form 863-10P, is a guide to selecting the correct cement, besides offering a description of types listed. Methods of application also are given for fused alumina, silicon carbide and fused magnesia, the types covered in this informative bulletin.

51. Chipping Hammer Tools

Arrow Tools Inc.—Pneumatic tools for chipping hammers such as high grade silico-manganese chisel blanks for chipping hard and tough alloy casting, flat chisels with both hexagon and round shanks machined to close tolerances to eliminate shank breakage and to insure correct fit in chipping hammers and chisels with various standard points are depicted and described in 4-page illustrated bulletin.

52. Magnetic Protector

Eriez Mfg. Co.—How nonelectric permanently magnetized Magnetic Hump removes tramp iron from materials conveyed in pneumatic, gravity flow or liquid lines is explained in 4-page illustrated bulletin No. 702. Included are construction and application data, information on selection of equipment and engineering diagrams.

53. Industrial Cranes

Industrial Equipment Co.—Single girder motor driven, single girder hand geared and jib cranes are depicted and described in 20-page illustrated bulletin MD-848, 8-page bulletin HG-948 and 8-page bulletin J-345, respectively. Many applications are shown as well as various accessories to extend usefulness of equipment.

54. Is It Small Cores?

Redford Iron & Equipment Co. makes an air operated cartridge type core blower that turns out small, intricate cores quickly and economically. Full information on machine and various accessories are given in 4-page illustrated bulletin G.

55. Parting Is Easier

Acheson Colloids Corp.—Sticking, galling and "freezing" of parts are eliminated when "dag" colloidal graphite dispersions are used. "Colloidal Graphite as a Parting Compound" is title of 6-page illustrated folder No. 427 which shows typical uses of this material ranging from separation of ingots from molds to coating permanent molds.

56. Ovens & Furnaces

Lanly Co.—Construction features of ovens which assure high efficiency in drying, baking, heat treating and similar operations are explained in 16-page illustrated catalog No. 490. Particular attention is given to details of foundry ovens which include drawer, shelf, rack, car and combination types. Many other industrial ovens are shown.

57. Sand Preparation

National Engineering Co. — Sizes and batch capacities of Simpson mullers as well as principle as applied to foundry sand preparation and control are related in 8-page illustrated bulletin 489. How smaller foundries can use standardized unit to provide for future expansion is explained in 6-page illustrated folder 490 which describes the Progressive sand preparing plant.

58. Foundry Practice

Basic Refractories Inc.—In addition to outlining basic practice in the foundry, this 12-page illustrated booklet, "Basic Foundry Practice" presents advantages and disadvantages of basic linings for cupolas. It then expounds on Gundol refractory, the BRI refractory gun and its benefits, ending with operating instructions.

59. Vibrators and Accessories

Complete specifications for various types of Branford vibrators are included in 48-page illustrated New Haven Vibrator Co. catalog G. Also included are hose, hose fittings, valves, oiling devices, mold cleaners, sprayers, flask and core rappers and other accessories. Instructions on installation and maintenance are included.

60. Dry Cores in Minutes

Allis-Chalmers Mfg. Co. — Dielectric heating which uses electronics to create high frequency field cuts core drying time from hours to minutes. Six-page illustrated bulletin 15B7306A tells what the Foundromatic core dryer is and how it works.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

8-51

FOUNDRY
Penton Building, Cleveland 13, Ohio

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61. Pyrometers

Claud S. Gordon Co.—Quick temperature readings in kilns, core ovens, driers and heat-treating furnaces; measuring surface temperature of stationary and revolving rolls, flat and irregular surfaces of molds, dies, etc.; and measuring temperatures of molten nonferrous metals up to 2500° F are some of the applications to which Xactemp pyrometers can be put. Complete range of types, their specifications and recommended usages are covered in 4-page illustrated bulletin.

62. Yard Crane & Loader

Form 51C of Mandt Mfg. Co. gives specifications of model 58 combination yard crane "swing" loader which is hydraulically operated. Telescopic boom is extendable from 12 to 16 ft for up to 20 ft ground clearance. As a tractor it has 4000 lb drawbar pull. With bucket loader, unit swings 180 degrees to either side and dumps to height of 8 ft 6 in. Speed is 12 mph.

63. Power Testing Machines

Details of construction, specifications and dimensions of screw power universal testing machines and accessories are in 30-page illustrated catalog RU-4-50, offered by Riehle Testing Machines Div., American Machine & Metals, Inc. Machines through 400,000 lb capacity are covered.

64. Coating for Patterns

McDougall-Butler Co.—4-page illustrated brochure gives all the dope on Hardlac improved pattern coating which protects patterns from oils, water, waxes, kerosene and gasoline and which prevents warping, swelling, wear and deterioration. It is made in standard pattern colors to conform with recommendation of AFA committee on Pattern Equipment Standardization.

65. Portable Electric Drills

Mall Tool Co. — Suggestions on care and maintenance of portable electric drills and tips on how to do jobs faster and better are given in 32-page illustrated pocket-size booklet "More Holes in a Hurry".

66. Flask Lift & Conditioner

Beardsley & Piper Co.—Two four-page illustrated bulletins 1705 and 1110 offer data and specifications of Champion Speed-Draw machines and Preparator heavy duty portable sand conditioner. Speed-Draw is offered in several models and capacities, while sand conditioner is offered in 60 ton per hour model.

67. Electric Arc Furnaces

Whiting Corp.—Details of Hydro-Arc electric arc furnaces are covered in considerable detail in 36-page illustrated bulletin FY-168. Equipment for top charging, how duplexing iron is carried out, tilting arrangements, substation equipment and controls and furnace shell capacities are included in coverage.

68. Foundry Refractories

Ironton Fire Brick Co.—"Refractories for the Modern Foundry" describes and pictures machine-made cupola blocks of Kentucky flint and semiflint clay together with other specialities of interest to foundry engineers and management. In addition to describing 4½, 6 and 9-in. series cupola blocks, bulletin No. 101 lists special block made to form any radius in cupola.

69. Sling Chains

Cleveland Chain & Mfg. Co.—4-page illustrated bulletin SC-48 describes and gives specifications of Sterling wrought iron sling chains. Safety rules governing use and data on inspection care and recommended load limits for various chain sizes and suspension angles are given for single and double slings.

70. Melting Kettles

C. H. Milles Foundry Co.—Data sheet presents dimensional data on round and rectangular melting kettles for smelting and die casting. They will accommodate zinc, aluminum, lead babbitt, and other nonferrous metals.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprints which we can furnish while they last.

71. Sound Bronze Castings

Use of insulated risers at Erie Bronze Co. to insure sound castings and increased metal yield is explained comprehensively in 8-page illustrated article "Insulation Increases Riser Efficiency." Procedure is outlined which results in 80 per cent of metal poured being saleable product.

72. Nodular Iron

"Comparative Growth of Gray Iron vs. Nodular Iron" is discussed thoroughly in 6-page illustrated technical reprint of article by well-known metallurgist. Tabulated are growth at 1650° F for various holding periods, chemical analyses of materials used, properties before and after treatment and microstructures.

73. Foundry Mechanization

Equipment and techniques employed in mechanized foundry which makes farm implement castings are described in 6-page illustrated reprint of story created by Pat Dwyer. Production obtained is triple that of previous layout using same floor space.

74. Production Casting

Steel grinding balls used in mining and cement industries are produced automatically at rate of 3 to 5 tons per hour in machine which uses water-cooled copper molds. Exactly how this machine works and casting procedure employed are outlined in 6-page illustrated reprint entitled "Casting Grinding Balls Continuously."

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Use AMERICAN CERAMIC STRAINER CORES

Now . . . you can be SURE of slag-free castings—save time and labor by using efficient, low-cost American Ceramic Strainer Cores.

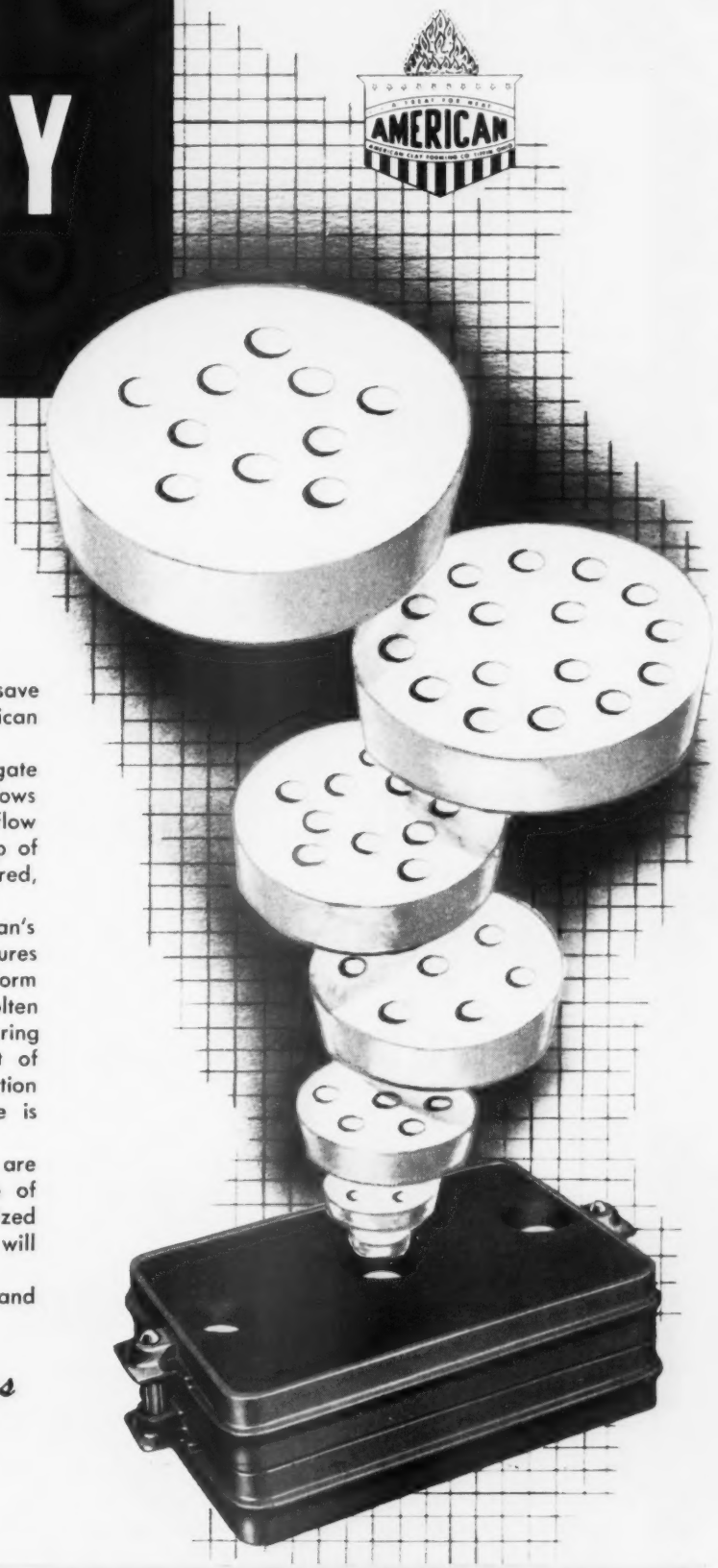
American's Ceramic Strainer Cores fit into the gate of the mold—they strain the molten metal as it flows through the holes of the strainer cores, making it flow smoothly into the mold. The slag remains on top of the strainer core and the result is an evenly poured, slag-free casting.

Machine made under high pressures, American's Ceramic Strainer Cores are fired to temperatures above 2400° F. They are very strong and uniform and are not effected by the heat shock of molten metal. The holes remain round and uniform during the pouring operation. Therefore, the per cent of rejected castings is held to a very minimum—production is increased and, of course, foundry labor time is definitely saved.

American's widely tested Ceramic Strainer Cores are available in eight sizes covering a wide range of requirements and are packed in convenient sized cartons for easy and quick handling. American will quote prices on special sized Ceramic Cores.

Write today for complete information, samples and the name of your nearest representative.

Assures Slag-Free Castings



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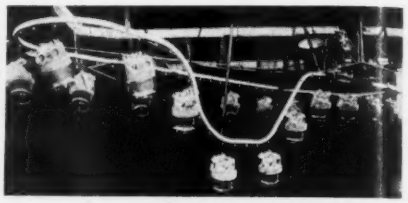
Smelting & Refining Division
Continental Copper & Steel Industries, Inc.
BUFFALO 23, NEW YORK

(*Continued from page* 216)

tects against overloading. It is claimed that the jaws can be closed without damaging the lightest castings or finished surfaces. Vise is controlled by two foot pedals—one for power, the other for release.

For More Details Circle No. 12—Page 217

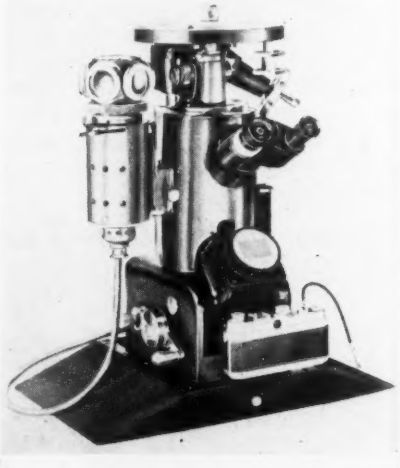
Conveyor: Southern Engineering Co., 249 North First St., Burbank, Calif.—Light capacity, power driven, overhead chain conveyor is designed to handle loads up to 30



lb on each pendant spaced at 6-in. intervals or, 60 lb loads can be carried at 12-in. intervals when supported by two pendants fitted with cross bar attachment. Conveyor may be operated in either direction and speed may be adjusted from 3 to 9 fpm while conveyor is in operation. Higher or lower speed ranges are available. To assure equal wheel loading regardless of the direction of chain pull, load wheels are mounted at a 45-degree angle to the load pendant and at a 90 degree angle to each other. Curves with radii as short as 15 in., and any combination or turns are said to be possible by joining horizontal, vertical top, and vertical bottom curves together.

For More Details Circle No. 13—Page 217

Metallograph: F. T. Griswold Mfg. Co., 1015 Packard Bldg., Philadelphia 2—Metallograph permits rapid, accurate structural analyses of



metal samples and other substances. Facilities for examination, study and photographic reproduction are provided for uses that are encountered

(*Continued on page* 223)

Thermex

ELECTRONIC CORE-BAKING EQUIPMENT

Saves $28,970 a year in core-baking

AT ONE PROGRESSIVE FOUNDRY* which replaced three conventional drying ovens with two THERMEX Core-baking Units, a cost comparison of old and new methods shows these results:

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LABOR FLOOR SPACE SAND & BINDERS UTILITIES MAINTENANCE REJECTS	100% WITH CONVENTIONAL OVENS	72.2% WITH THERMEX CORE-BAKING EQUIPMENT

This represents a saving of 27.8% for each 1000 pounds of finished cores. Based on the foundry's total production, *annual savings amount to $28,970. Thus the new THERMEX Core-baking Equipment will pay for itself in less than a year.*

Why not take advantage of this labor-saving, cost-cutting equipment? A THERMEX field engineer will be glad to show you engineering economy studies, based on installations like this, which give complete cost data. Write The Girdler Corporation, Thermex Division, Louisville 1, Kentucky.

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Phoenix Brass Fittings Corp.
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United Foundries, Inc.
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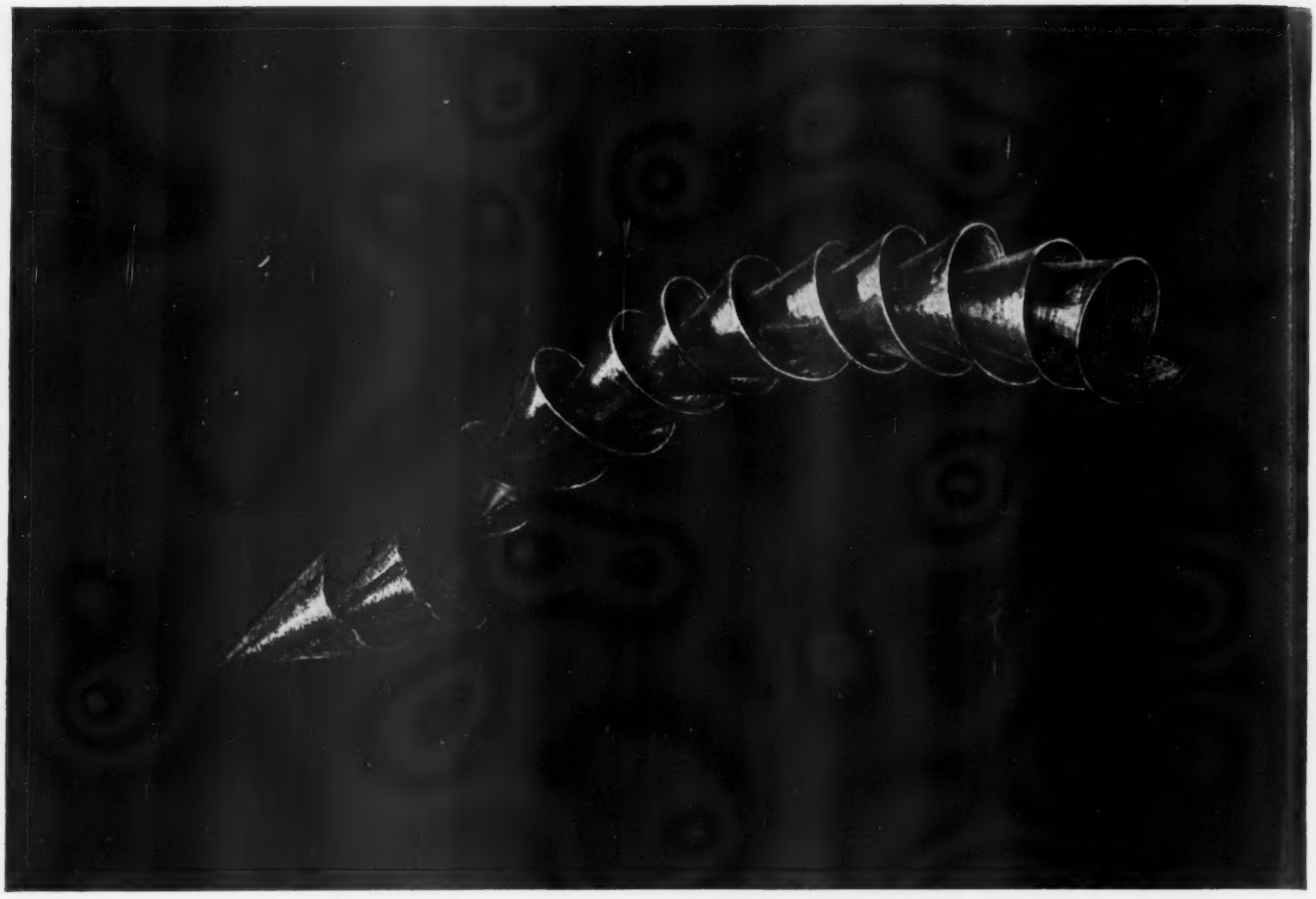

TURN SHAVINGS INTO SAVINGS!

There are several ways foundries today can conserve metals, reduce costs, and increase profits...through the adoption of the Croning Process. This "C" Process utilizes special BAKELITE Phenolic Bonding resins for the rapid heat-setting of *thin-shell* sand molds and cores.

Foundries are reporting tolerances of .002 to .005 of an inch per inch on parts cast by this process. Besides, the castings possess wellnigh pattern-smooth surfaces.

Such castings conserve metals by greatly reducing the amount of machining required, often just a finish cut being needed. They conserve metals by minimizing rejects. Whether you cast ferrous or non-ferrous metals, these thin-shell molds and cores will reduce your scrap pile—or your customers' if they do the finishing—and pile up greater production instead!

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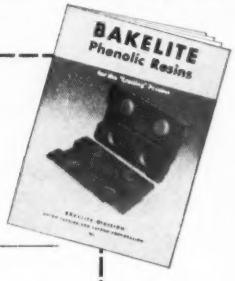
Why not investigate fully this technically advanced method of casting. Write Department BW-29 using the coupon provided for your convenience.



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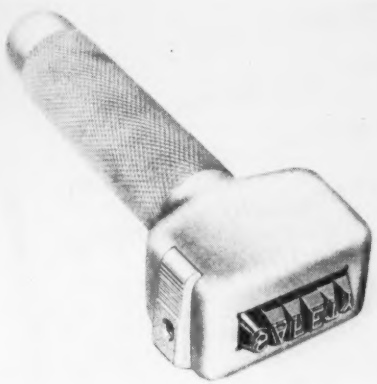
(*Continued from page* 220)

from research to routine testing. A large assortment of objective, ocular, and projective lenses are provided. These are parfocal and parcentered, coated on all air-glass surfaces, and corrected for infinity. Metallograph occupies table space of less than 12 x 12 in. Overall height is 18 in. Controls are provided for fast, positive manipulation of all variables. Lenses are inserted and removed quickly, and need no centering. No focusing is necessary when lenses are changed, it is claimed. Other features claimed are that the technician can observe the sample through binoculars or on a ground glass screen without changing his position. Photographs may be taken on 35 mm roll film by swinging the image from the ground glass to the camera.

For More Details Circle No. 14—Page 217

Stamping Tool: M. E. Cunningham Co., 97 East Carson St., Pittsburgh—Hand type holder with a round, knurled handle for general



industrial stamping is said to permit the workman to get a full grasp on the shank. Holder is made of "safety" steel to prevent spalling and mushrooming. Design includes a patented quick change snap slide for changing type inserts and for retaining the type pin in the holder. This holder can be made for one or two lines of type, with any size character.

For More Details Circle No. 15—Page 217

Hardness Tester: Peabody Industries Inc., 12129 Hamilton Ave., Highland Park 3, Mich. — Hardness tester contains a hardened steel rod which is locked in position when raised by the knob at top of the tester. A trigger releases the plunger, which rebounds from the surface of the metal being tested. At the highest point of rebound, the plunger is locked in position permitting hardness readings on the instrument's Rockwell B and C, and brinell scales.

(*Continued on page* 225)

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✓ **REDUCED HANDLING TIME**

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USES INCLUDE: cutting gates and risers off stainless and chrome vanadium castings, cleaning up welds (especially stainless welds) and foundry finishing operations on monel, stainless steel, etc.

Many grinding and cutting jobs that were tedious and expensive by older methods are made easy and economical with the Cleco 1480-A Edge Grinder. Many users report that jobs which were formerly difficult on a production basis are made easy with the Cleco 1480-A. In some instances the 1480-A paid for itself in less than six weeks.

If you are grinding or cutting monel or hard alloy steel you owe it to yourself to find out what the Cleco 1480-A will do. Give us the particulars of your problem. A Cleco Field Engineer can help you solve it — without obligation.

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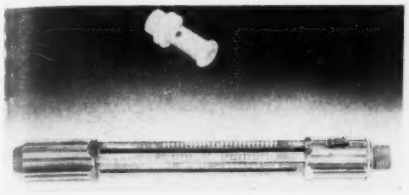
(*Continued from page* 223)

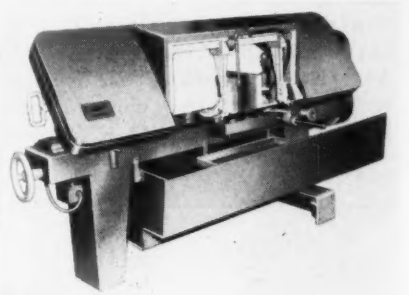
Locking of the plunger following its rebound is accomplished by three steel balls in a retainer machined from nylon rod. Nylon is used because of its antifriction characteris-



tic, which prevents instrument from becoming inaccurate due to friction on the plunger. Nylon also is said to require no lubrication and is unaffected by various shop cleaning fluids. The retainer is machined from nylon rod made by Polymer Corp., Reading, Pa.

For More Details Circle No. 16—Page 217

Band Saw: Machine Tool Division, Kalamazoo Tank & Silo Co., 500 Harrison St., Kalamazoo, Mich.—Metal-cutting band saw is designed to provide fast, accurate production cutting of metals up to 12 x 20 in., flat and 12 in. and over, round. Features include four cutting speeds (61 to 259 fpm); a dash-pot mechanism to insure controlled, constant pressure during complete cut; swivel leaf type 45 degree vise for adjustment of cutting angles; blade mounting from the top, and an unobstructed view



of cutting operation. Standard equipment includes 1 hp, 220/440/60/3 motor and stock stop bar. Saw is 87 in. long and 26 in. wide, with 25½-in. bed height.

For More Details Circle No. 17—Page 217

Foundry Products: Industrial Sales Dept., Perlite Division, Great Lakes Carbon Corp., 18 East 48th St., New York 17—New products in the form of dry, lightweight, inorganic aggregates or powders are said to have three foundry applications that can help improve quality and reduce costs. They are as an additive in molding sand to act as a cushioning agent to reduce expansion defects, buckles and rat tails; an additive in

(*Concluded on page* 226)

Foundry work moves faster with

2 SPEED METEOR ELECTRIC HOISTS

Capacities from ½ to 5 tons

To meet demands for greater production and higher efficiency, many progressive foundries are replacing obsolete, undependable handling equipment with new heavy duty, two-speed Meteors. Designed specifically for foundry work, the Meteor provides slow speed for careful starting of loads... and high speed for fast lifting when the load is free. The Meteor is fully enclosed, weather-proofed and protected against dust and dirt. Airplane-type cooling fins quickly dissipate heat generated by gears and load brake. Low headroom, precision construction, motor thermal protection, only 110 volts in push button station, helical gears, are other quality features. If you want extra value for your investment, write today for literature and prices.

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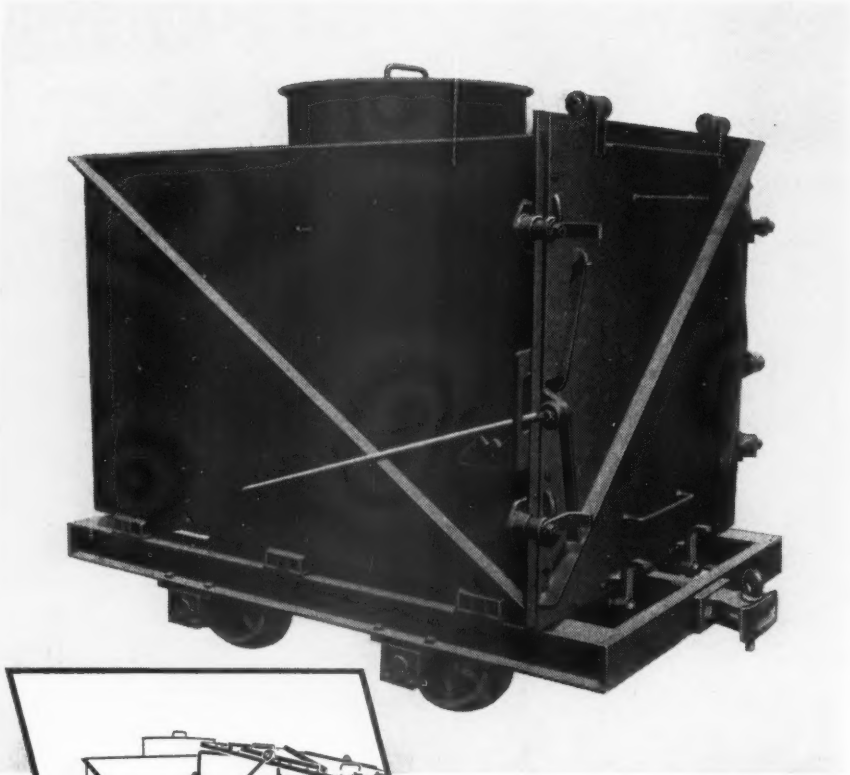

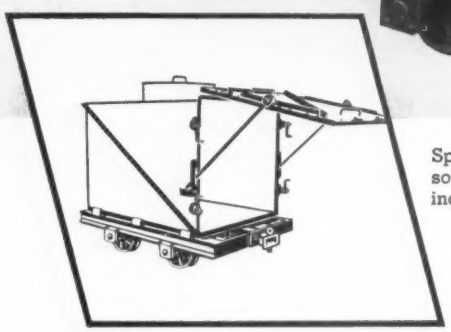

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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

PENN IRON WORKS, INC.

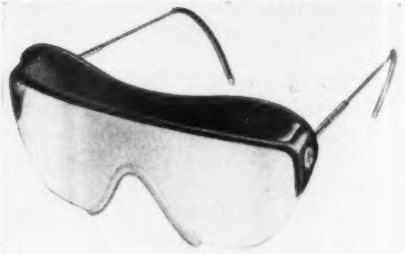
READING, PENNSYLVANIA

(*Concluded from page* 225)

core sand to improve blowability of sticky sands, and as riser insulation to aid in the control of directional solidification, with minimization of shrinkage cavities in the riser head.

For More Details Circle No. 18—Page 217

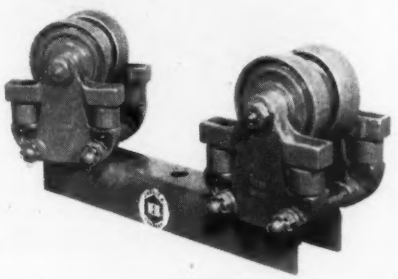
Goggle: Watchmoket Optical Co., 232 West Exchange St., Dept. 26, Providence, R.I.—Plastic goggle features adjustable temple length,



adjustable lens angle, and reversible bridge. (Bridge is thick on one side, thin on the other, and may be reversed so that either side touches wearer's nose.) Goggle is made of lightweight plexiglas and weighs 1¼-oz. Impact strength is said to exceed federal specifications for drop ball and drop needle tests for tempered glass. Ultraviolet restraint is 100 per cent in the range harmful to the human eye. Rolled front design, curved one plane only, allows wide range of vision.

For More Details Circle No. 19—Page 217

Trolley: Jervis B. Webb Co., 8951 Alpine St., Detroit—New 6-in. hand push trolley is designed for heavy loads and short radius curves. Two 2-wheel trolleys are mounted on a steel load bar in such a manner that they can negotiate a minimum



radius curve of 18 in. Unit is particularly adaptable to installations not requiring a continuous trolley conveyor. Side rollers prevent trolleys from binding on the I-beam when making a curve, and use of ball bearings with ground races is said to enable one man to push a 1-ton load with ease. Two trolley assemblies connected to a third load bar would permit handling a 2-ton load. Trolleys may be used only on standard 6 in., 12.5-lb I-beams.

For More Details Circle No. 20—Page 217

Brief Notes for Busy Foundrymen

How much "Lift" does metal have against a sand core or a sand mold?

The old-timer had to discover the above question by trial and error before scientific data was obtained.

When molten metal completely surrounds a sand core, the core is said to be submerged and therefore the "lift" can be calculated.

Magnesium, the lightest of our production metals, requires the least amount of weight to prevent the metal from "lifting" but another non-ferrous metal, lead, has one of the greatest.

It is claimed that a green sand mold surface will withstand a pressure of about 5 lbs. p.s.i. without deforming in the casting operation, if rammed to average hardness, about 70.

Ferrostatic pressure affects the pressure on the mold surface, but does not alter the lift of a core surrounded by metal.

To determine the "lift" of the metal, weigh the core that is to be submerged and then multiply it by the following factors:

●

If part of a core is surrounded by metal, figure only that part.

Magnesium	.08
Aluminum	.60
Cast Iron	3.5
Steel	3.9
Brass	4.25
Copper	4.5
Lead	6.1

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Adventures of BILL

By PAT DWYER
Illustrations by RICHEY

THE other day," Bill said, "my old friend Bill Roesner, now living the retired life of Reilly in La Crosse, Wis., sent me a picture of a beautiful bronze statue which recently had come into his possession. The figure was that of a husky looking guy with lots of hair and whiskers, and just enough clothes to get by the censor. The right hand grasps the center of an upright long bow, and the left hand grasps the bow near the top. The bow man is partly seated on a tree stump and the general pose and bulging muscles indicate that he is adjusting the cord. A note on the back of the picture, in Bill's elegant handwriting, states that the title of the picture is "Ulysses Bending The Bow." What I should like to know—if I don't strain the bonds of friendship too far—is: Who is this guy? Why does he rate a bronze statue? Do you say his name, whistle it, or do it as a Swiss yodel U-lee,U-lo, U-lee-i-o-u? And finally, is he bending the bow with hostile intent, or merely to shoot a little bull?"

"Beg to report Sir, bonds of friendship ample to withstand anticipated strain. According to the late Mr. Homer, Ulysses flourished — and flourished is right—several thousand years ago. He was the hero of more hair-raising adventures than any soldier of fortune before or since. Why does he rate a bronze statue? A very good question indeed. Since in all probability you will not have occasion to use the name more than once or twice in an ordinary life time, the proper pronunciation is not a factor of any importance. You can say it, whistle it or yodel it. Who cares? And finally, as the statue shows, he is bending the bow with definitely hostile intent.

"Several episodes in the late Mr. Homer's long-drawn-out story incline me to the opinion that he was levying freely on his imagination, or, as you might say, he was a pretty handy lad with the long bow. However, the scene dealing with the hero's return disguised as a beggar, just to give the situation the once over before declaring himself, bears all the marks of authenticity.

"When a man has been away from home for twenty years, he cannot be too careful upon his return. In this instance the situation was further complicated by the fact Mrs. Ulysses never had a telephone installed in her residence. Telegraph wires presumably were down everywhere and the postal system was all shot to pieces. Maintenance men were either in the service or working in munition factories. Ulysses in his beggar's disguise did a little scouting around the house and barn, asked the inside help and the hired man a few discreet questions on the general lay of the land. Happy in the discovery that the lady Penelope still held him in proper wifely esteem and never had given up hope of his eventual return, he oozed into the kitchen with a view of declaring himself at the most opportune moment during the evening festivities. Incidentally, he hoped to grab a small snack and maybe a cup of coffee.

"The occasion arrived sooner and in more dramatic manner than he had anticipated. Penelope, paragon of conjugal fidelity, by clever subterfuges for many years had repulsed advances of her army of suitors. On this particular night she thought up a new stunt that showed she was a fit mate for her distinguished warrior husband. She remained a gracious lady, calm and smiling throughout the ordeal. Beyond occasionally touching her jeweled side combs with the tips of her daintily manicured fingers, she manifested no alarm when the wrecking party started to work.

"Eyes of love are keen and bright. Her little test confirmed her intuition that the beggar's rags covered the form of her long lost lord. The same test afforded Ulysses an opportunity of proving his identity, and incidentally the exquisite pleasure of speeding a bunch of schmos and yahoos to the happy hunting grounds. He was quite peeved to learn how they had been annoying his lady during his absence.

"To the assembly the lady announced that at length she reluctantly had given up hope of her man's return. Now she was ready to wed the one among her guests who could bend the great war bow Ulysses had left behind when he departed from Ithaca twenty years before in the general direction of the windy plains of Troy and points East.

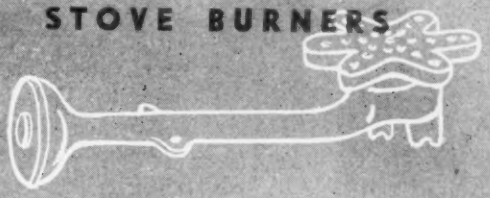
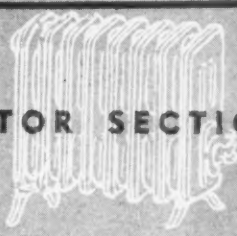
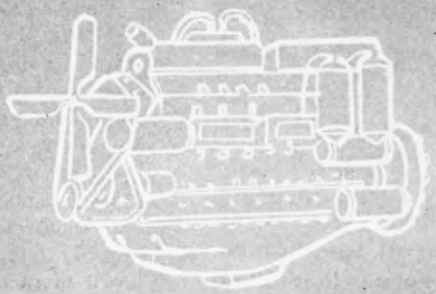
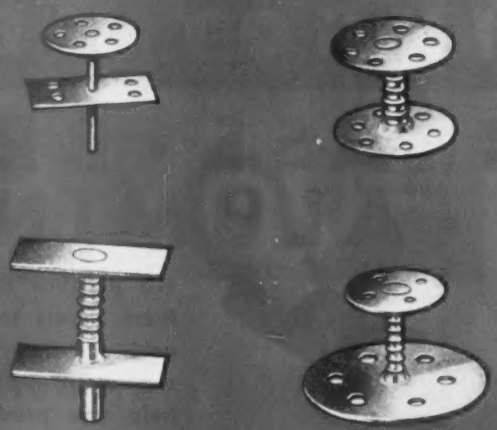
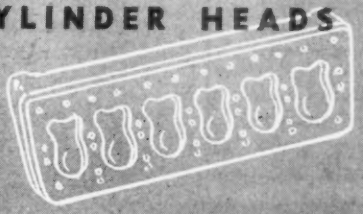
"Several guests tried the test without success. The beggar then stepped forward, as of course she knew he would. He seized the great bow

(*Continued on page* 230)

Father and son engage in spirited debate with welcoming committee

FANNER MOTOR CHAPLETS

THE BEST CHAPLET FOR CASTINGS UP TO 1" METAL THICKNESS

Type of Application	Type of Chaplet Used
STOVE BURNERS 	
RADIATOR SECTIONS 	
GASOLINE OR DIESEL ENGINES 	
PUMP CASTINGS	
CYLINDER HEADS 	

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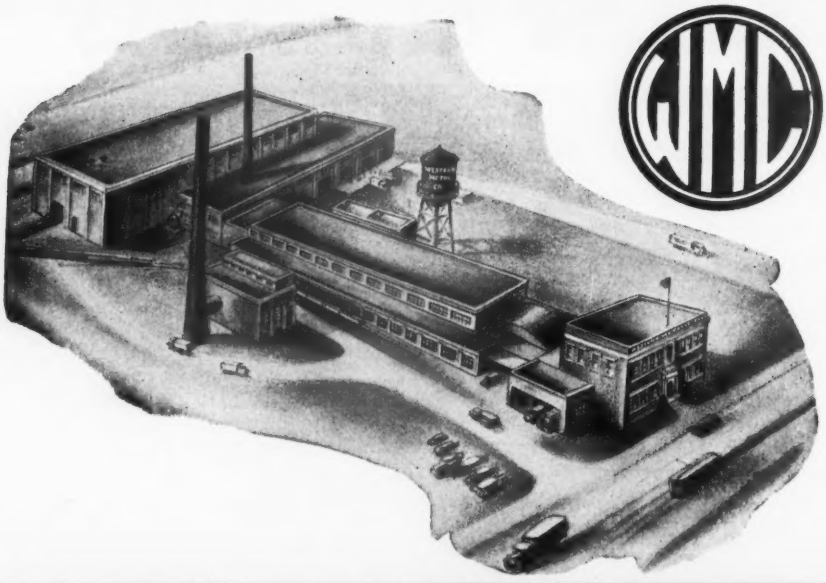

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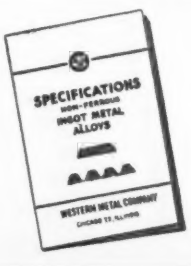

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SMELTERS AND REFINERS OF BRASS AND ALUMINUM INGOTS

(*Continued from page* 228)

with one hand and adjusted the cord with the other hand. The instant he twanged the string a chilly conviction sank into the hearts of the men sitting around the banquet hall. They realized they would have to jump quick and sudden. Either kill the bow man or be killed by him. Seizing their weapons to make a concerted attack, they discovered that they were confronted not by one man, but by two.

"Young Telemachus recently returned from a year's futile search for his father was an interested spectator. He had suspected nothing until he saw the great bow bend and the cord snap into place. He was a baby in the cradle when his father sailed away from Ithaca. He had no personal recollection of his appearance. No message ever had been received from the rover. Now, thanks to his mother's training and his own filial instinct, he knew that the man standing alone on the platform facing sudden and violent death, was his father. Knew it as well as if he had walked by his side, held his hand and talked to him all the days of his life.

"His ringing, joyful shout as he leaped sword in hand to his father's side was as much an indication of recognition, pride and love for a parent as it was one of defiance to the mob launching the attack. Idea of personal danger never entered his mind or, if it did, instantly was dismissed in face of the fact that here was his father in imminent danger, a father he had come to love, to know intimately through the adoring eyes of his mother.

"Why linger over the gory details? Father and son stood side by side, the one a replica of the other. They waged what is regarded by competent connoisseurs as one of the prettiest engagements ever recorded. Each time the great war bow hummed one or two of the assailants experienced the highly unpleasant sensation of feeling a streak of greased lightning in the shape of a yard-long arrow whistling through his engine room putting the pumps and lighting system out of commission. Down with all hands. A total loss.

"Those who pressed too close had their heads neatly and accurately severed from their bodies at the second vertebra joint by a young man with the raging lust of battle in his eyes and the giant strength of his father in the capable and hairy hands that whirled aloft a dripping, venge-

(*Continued on page* 233)

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(*Continued from page* 230)

ful and two-edge sword. Believe me, what they did to those birds was a plenty. I think we safely may assume that after the little detail of house cleaning was attended to the happy reunited family lived in peace and comfort ever afterward."

"Since you know so much about it," Bill said, "perhaps you can answer one more question. In a note which accompanied the picture Bro. Roesner wrote: 'Unfortunately the molder, melter and sculptor who created this work of art in wax and bronze is or are unknown. No signature or other mark of identification is cast or stamped upon the statue which is 24 in. high and 11 in. square at the base. The statue stands upon a black onyx base and square quarter sawed oak pedestal 24 in. high. The hair, eyes, the straining muscles, even the toe and finger nails are perfect and to scale. The cord or bow string shows the weave of the linen. The quiver behind the figure shows even the feathers in the arrows. The shield and short sword lie behind the stump upon which the man is partly seated. You almost can tell the age of the tree from the rings showing on the end of the broken stump. The helmet at his feet shows the delicate tracery of the attached plumes. Any information as to the foundry which may have made this particular statue, or comment of any kind will be appreciated.'

"So there y'are, young fella-me-lad. Can you throw any light on the identity of the person or persons who designed, sculped and cast this masterpiece?"

"Replying to your valued inquiry of recent date," I said, "I shall be pleased to consider your problem after I have found the mythical needle in the more or less mythical hay stack. Following the example of our highly esteemed Navy I always do the hard jobs first. The impossible jobs take a little longer. As a preliminary, hoping for the best but fearing for the worst I shall get in touch with several art centers. Possibly some person connected with one of these institutions may spot this particular needle. We shall see. We shall see."

"Well," Bill said, "now that that is settled to the satisfaction of one and all you may be interested in another inquiry I had lately from an honest lad who wrote as follows: 'One of my non-foundry friends stated that in a magazine story the author claimed that no casting over

(*Continued on page* 236)

ONE MAN and a *Silent Hoist* electric-driven Car Puller can pull and spot cars . . . warp barges . . . drag pallet or skid loads, logs, quarry stone, heavy equipment . . . bend pipe . . . open hopper doors... etc. ... and Cut Your Materials-Handling Costs!

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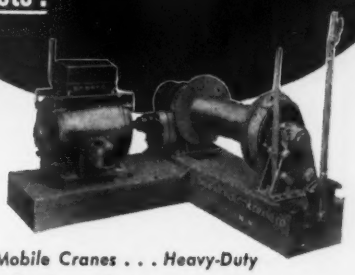

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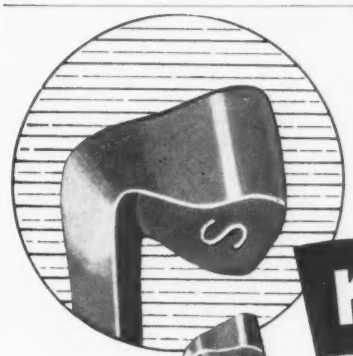

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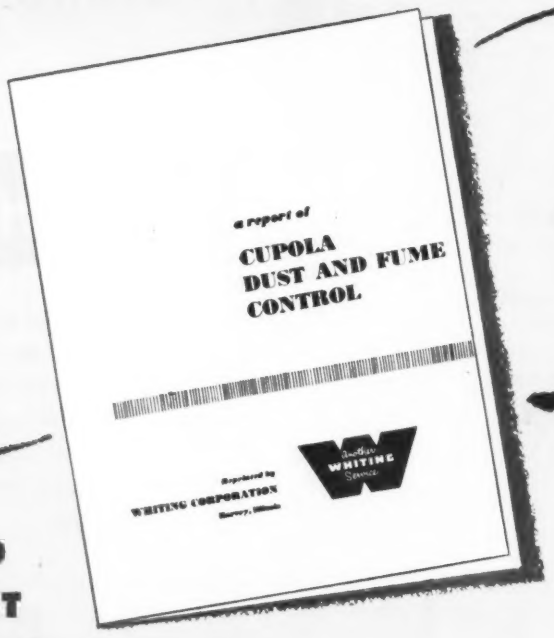

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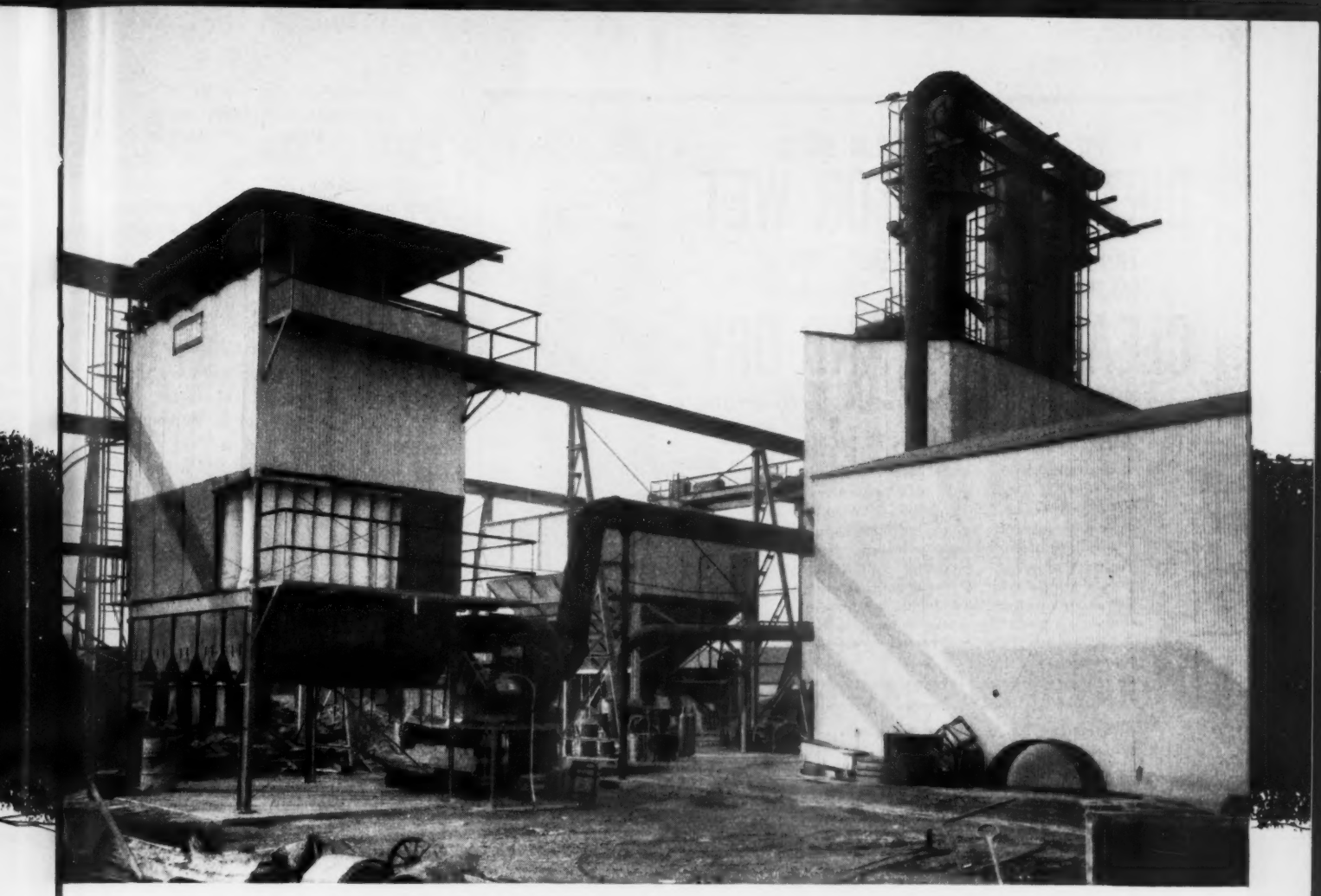

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This General Metals installation is the *first to pass official tests* given by the Los Angeles Smog Control Board . . . and the first to receive an operating permit from them. Now, with the Whiting Suppressor, it is possible for foundries everywhere to meet the most stringent regulations governing cupolas, metallurgical furnaces and other sources of dust and hot gases.

The Whiting Bag-Type Suppressor collects gases from the cupola stack and cools them by water spray to a safe temperature for bag filtration. A fan which draws the gases from the top of the stack through the conditioning chamber also blows these gases to the bag suppressor. Groups of cylindrical bags, made of non-flammable heat-resistant material, collect the fines. These bags are easily and quickly emptied without interference with cupola operation. They may be shaken manually as is done at General Metals, or equipment can be provided for automatic mechanical shaking.

A Whiting Suppressor system is simple in construction and easy to operate and maintain. It provides safe, highly efficient, continuous operation at low cost.

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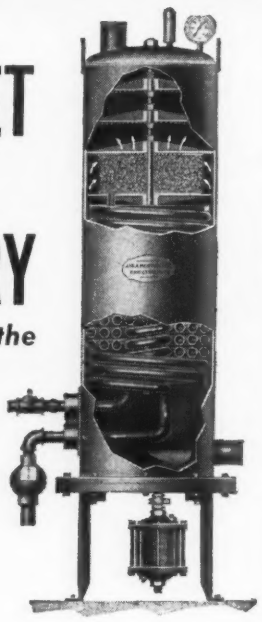

This Aftercooler-Separator-Filter is completely automatic. It is built in 1" to 6" pipe sizes and for capacities of 50 to 2,000 CFFAPM. The economies effected by the MURPHY pipeline aftercoolers are pleasantly amazing. Some of the most prominent companies in the country, after the installation of these units, have made the statement that they could not believe an aftercooler could be made to give such wonderful results. Each unit carries a money-back guarantee.

HAMILTON SPRAY GUN

Molders find this gun very useful for spraying molds and cores with any liquid. It can be used for cleaning electric motors, gasoline motors and machinery. Also for laying dust. It has a Neoprene disc valve, a trigger control, and is made of good brass. Length overall 6½". Weight without suction hose and sinker 18 oz. Two nozzles, ⅛" and ¼".

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PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

This tool eliminates swabs, brushes and spray cans. With it a man can blacken molds faster and more efficiently. The MURPHY PISTOL SPRAYER shoots the blackening into hidden pockets, beyond swab reach. Jobs are finished faster, the resulting castings peel better and the work comes cleaner. Used for silica wash, oil, water or any liquid material.

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JAS. A. MURPHY & CO.

FIFTH AND VINE STREETS, HAMILTON, OHIO

Moisture Elimination Up To 3000 Pounds Per Square Inch

(*Continued from page* 233)

100 tons ever had been made. On several occasions in FOUNDRY I have seen references to castings weighing over 100 tons. If the records are available I shall greatly appreciate your courtesy in supplying a list.'

"I wrote him that demand for 100-ton castings is not quite as brisk as it is for—say—motor blocks, car wheels, pipes or flat irons, but at least three foundries exist within a few miles radius of the hotel where the interview mentioned in the story was supposed to have taken place. Each of these foundries can and has made castings weighing 125 tons and over. Not as spectacular exhibitions, but simply as part of the routine day's work. At least three other foundries in the same state have facilities for handling large castings, either iron or steel. Almost 20 years ago one of these plants produced the largest and heaviest steel casting ever made in a foundry up to that time, 230 tons clean and machined. Approximately 290 tons of steel was melted simultaneously in six open-hearth furnaces.

EXAMPLES OF LARGE CASTINGS

Chinese cast iron lion, 20 ft high, 16 ft in length
Japanese Buddha, bronze, estimated weight 200 tons
Great Bell of Moscow, bronze, estimated 220 tons
Hydraulic press platen, steel, Bethlehem Steel Co., 230 tons
Anvil base, gray iron, Russia, estimated weight 600 tons
Ingot mold, gray iron, Bethlehem Steel Co., 200 tons
Forging press frame, United Engineering & Foundry Co., 236 tons
Forging press frame, United Engineering & Foundry Co., 242 tons
Forging press castings, Mesta Machine Co., several 200 tons each
Anvil base, gray iron, Terni Societa Per L'Industria E L'Electtricita, Italy, 1000 tons

"Even a casual examination of foundry literature would have shown that 125-ton engine beds have been made on many occasions in Buffalo and Milwaukee foundries. The author of the magazine story has not enough fingers and toes on his hands and feet to count the number of foundries with facilities for melting hundreds of tons of iron every day in pipe shops, car wheel shops, automotive and other foundries. In two prominent Michigan automobile foundries the daily heat exceeds 2000 tons.

"'Tis true the ordinary railroad car is not capable of carrying a 125-ton load. When the occasion arises, special cars are provided. Immense roll housings and anvil bases, varying in weight from 100 to 150 tons have been shipped from Cleveland, Chicago and Pittsburgh to plants

(*Concluded on page* 238)

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At Lowest Cost

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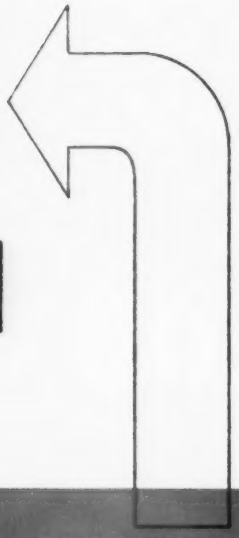

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Industrial Supply Co.
San Francisco, California

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La Grand Industrial Supply Co.
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La Salle Builders Supply, Ltd.
Montreal, Quebec, Canada

Marthens Company
Moline, Illinois

Carl F. Miller & Co.
Seattle, Washington

Pennsylvania Foundry Supply & Sand Co.
Philadelphia, Pennsylvania

Refractory Products Co.
Evanston, Illinois

Robbins & Bohr
Chattanooga, Tennessee

Smith-Sharpe Company
Minneapolis, Minnesota

Steelman Sales Co.
Chicago, Illinois

Stroller Chemical Co.
Akron, Ohio

Wehenn Abrasive Co.
Chicago, Illinois

Mr. Walter A. Zeis
Webster Groves, Missouri

(*Concluded from page* 236)

built in recent years. Big guns up to 100 tons were cast in Providence and Boston in the late seventies and early eighties, when the railroads and the rolling stock were not as heavy as they are at present. The guns were shipped to their various destinations.

"As a plain matter of fact and record the history of the foundry industry is sprinkled plentifully with descriptions of extra large castings—iron, steel and bronze. Many were made under extraordinary and adverse conditions. In the Russian city Odessa on the upper left hand corner of the Black Sea in 1865, an able foundryman and crew poured the largest iron casting of which we have any record up to about a year ago. The casting was an anvil for a huge steam hammer, estimated weight 600 tons. A battery of American cupolas kept a constant stream of iron flowing until the mold was filled. Probably the author of the magazine story would not accept that evidence on the weazely excuse that the work was done by a bunch of foreigners who could not speak or write English. I felt that the accompanying list will restore your faith and incidentally stick a sprag in the bouncing wheel of non-technical writers who nearly always burn their fingers when they venture into a field of which they know nothing."

Issues Film on Principles Of Automatic Control

Instrument Society of America, 921 Ridge Ave., Pittsburgh 12, has produced a 55 minute, 16 mm, full color and sound film entitled "Principles of Automatic Control." Produced as one of the society's educational projects, the film is intended to be useful in presenting the subject of automatic control to students, technical personnel, instrument mechanics, production supervisors, and operators. Flm can be rented or purchased outright.

Training Lecture Offered

United States Department of Labor, Bureau of Apprenticeship, Division of Publications, 14th and Constitution Ave., Washington, D. C. has reprinted a lecture, "Training at the Utah Copper Division, Kennecott Copper Corp.," on industrial training in the mining industry, prepared by Howard B. Gunderson, supervisor of training for Kennecott. Other apprentice training booklets are available.

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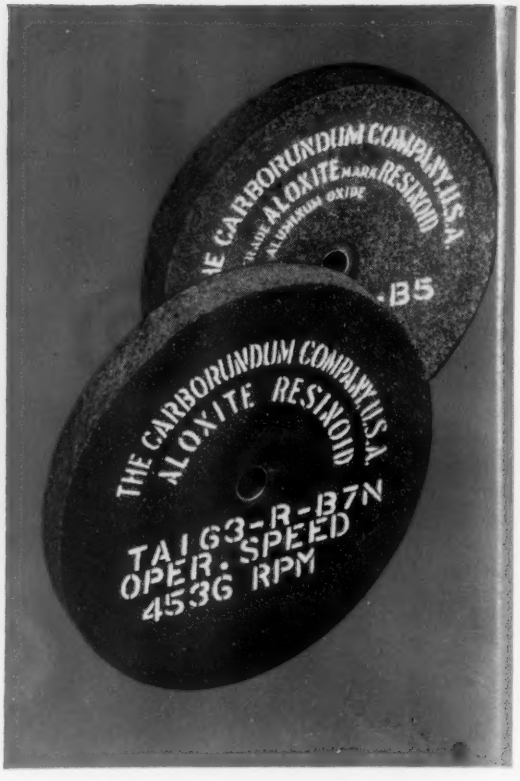

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Beryllium Copper Castings

(*Continued from page* 93)

conditions permit. In all work, the approximate composition should be known to insure the proper mixture of virgin metal, clean scrap and remelted or secondary metal.

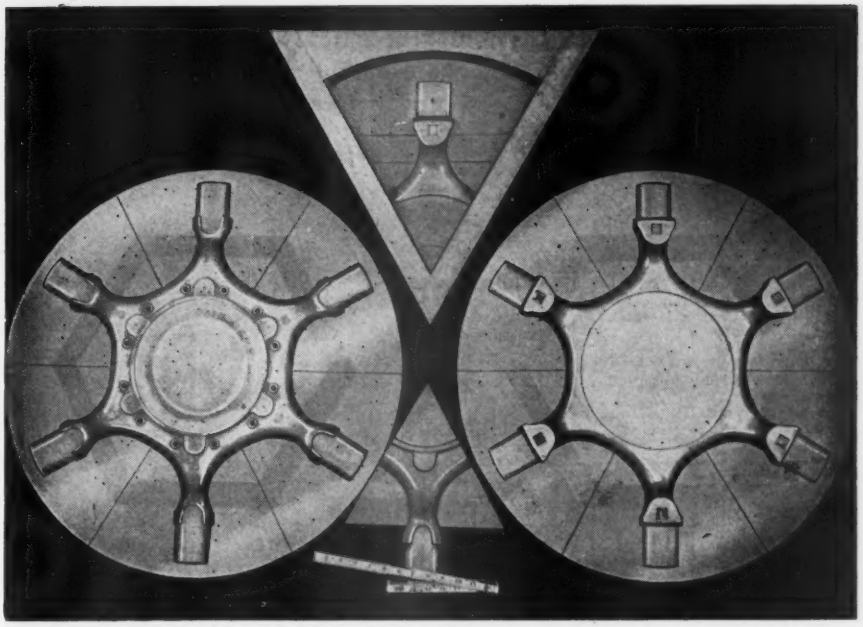
Impurities must be controlled to prevent loss of strength and conductivity in the final casting. This is particularly true in casting heats containing miscellaneous scrap. When available, analytical methods should be used to insure that impurities are below the maximum listed in Table II. As supplied, the beryllium content of casting ingots for all alloys runs approximately 0.10 per cent higher than table values, to allow for some loss during melting. After melting the compositions should fall within listed limits.

Check Additive Influence

The influence of additives and impurities varies considerably. In 20C and 275C alloys small quantities of cobalt inhibit grain growth and stabilize the time-temperature relationship during the hardening treatment. In 10C alloy the cobalt content is fairly critical and should be maintained to insure proper conductivity and hardness response. Although silicon promotes fluidity, large quantities form excessive beryllium silicide and promote brittleness. Similarly, the nickel content should be limited, otherwise nickel beryllide will be formed. Lead over 0.05 per cent results in hot shortness and causes discoloration during pickling, while phosphorus should also be carefully controlled. Iron, aluminum, tin, zinc and chromium in small quantities are not detrimental; however, relatively large amounts of these and other impurities not specifically mentioned may give reduced hardness and conductivity.

Some caution should be observed in remelting scrap, since some loss of beryllium can be expected. Oxidation losses may approach 0.15 per cent and usually average 0.10 per cent (5 per cent of beryllium content). Scrap such as gates and risers can be remelted approximately three times without appreciably reducing the hardness through decreased beryllium. By charging some virgin pig with scrap for each remelting operation, the beryllium content can be readily maintained. Recommended procedures for determining the beryllium analysis are discussed later.

By first charging scrap and melting, then adding virgin pig, beryllium losses can be reduced. In addition,



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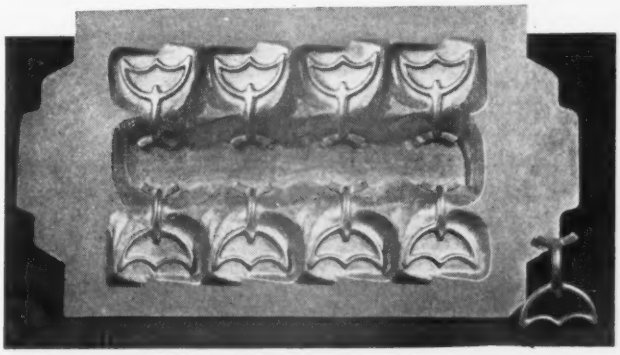

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TABLE III—Typical Physical Properties for Heat Treated Beryllium Copper Casting Alloys

	Alloy			
	20C	275C	10C	50C
Specific gravity	8.09	8.09	8.62	8.62
Density, lb per cu in.	0.292	0.292	0.311	0.311
Magnetic properties	nonmagnetic	nonmagnetic	nonmagnetic	nonmagnetic
Melting range, °F	1585-1780	1625-1710	1780-1990	1840-1960
Shrinkage, in. per ft	3/16	3/16	3/16	3/16
Specific heat, cal/gm/°C, 30-300° C	0.10	0.10	.....	.....
Maximum increase in density on heat treatment, %	0.6	0.6	.....	.....
Maximum decrease in length on heat treatment, %	0.2	0.2	.....	.....
Elastic modulus in tension	18,500,000	19,000,000	17,000,000	16,000,000
Average coefficient of linear expansion:				
Per °C, 20-200° C	0.000017	0.000017	0.000018	0.000018
Per °F, 68-392° F	0.000009	0.000009	0.000010	0.000010
Electrical conductivity, % IACS	20-25	18-23	45-50	48-53
Electrical resistivity, microhm cm	8.6-6.9	9.5-7.5	3.8-3.4	3.6-3.3
Thermal conductivity:				
Btu/sq ft/ft/hr/°F	54-67	50-63	117-133	117-133
Cal/sq cm/cm/sec/°C	0.22-0.28	0.21-0.26	0.48-0.55	0.48-0.55

TABLE IV—Typical Engineering Properties of Beryllium Copper Casting Alloys

Properties	Condition	Alloy 20C	275C	10C	50C
Rockwell hardness	cast	B75-85	B80-90	B48-55	B45-55
	cast & aged	B90-100	B90-100	B65-75	.....
	cast & solution annealed	B65-75	B80-90	B30-40	B30-45
	solution annealed & underaged	C37-43	C40-44	B92-97	.....
	fully aged	C38-45	C42-48	B92-103	B92-100
	overaged	C34-37	C35-40	B92-97	.....
Brinell hardness	cast	137-165	150-185	81-100	79-100
	cast & aged	185-240	185-240	116-137	.....
	cast & solution annealed	116-137	150-185	67-75	67-79
	solution annealed & underaged	342-404	372-415	195-222	.....
	fully aged	352-426	393-460	195-262	195-240
	overaged	313-342	322-372	195-222	.....
Ultimate tensile strength, psi	cast	70- 85,000	90-105,000	45- 55,000	40- 55,000
	cast & aged	85-110,000	95-110,000	75- 90,000	.....
	cast & solution annealed	60- 70,000	80- 90,000	40- 50,000	40- 50,000
	solution annealed & underaged	145-160,000	125-155,000	90-100,000	.....
	fully aged	150-175,000	140-165,000	100-120,000	95-110,000
	overaged	150-170,000	135-160,000	80- 90,000	.....
Proportional limit (0.002% offset), psi	cast	20- 30,000	40- 50,000	10- 20,000	10- 20,000
	cast & aged	25- 40,000	40- 50,000	35- 55,000	.....
	cast & solution annealed	8- 15,000	15- 25,000	6- 12,000	8- 15,000
	solution annealed & underaged	95-120,000	60- 95,000	40- 55,000	.....
	fully aged	105-125,000	85-105,000	45- 70,000	50- 65,000
	overaged	95-115,000	80-105,000	40- 50,000	.....
Yield strength (0.2% offset), psi	cast	40- 50,000	50- 60,000	15- 25,000	15- 25,000
	cast & aged	45- 60,000	55- 65,000	65- 75,000	.....
	cast & solution annealed	25- 40,000	20- 40,000	8- 15,000	10- 18,000
	solution annealed & underaged	110-130,000	100-120,000	50- 65,000	.....
	fully aged	115-155,000	110-130,000	55- 70,000	65- 85,000
	overaged	110-140,000	110-130,000	50- 65,000	.....
Elongation in 2 in., %	cast	15-30	15-25	17-25	27-33
	cast & aged	10-25	15-20	12-18	....
	cast & solution annealed	30-45	15-20	25-30	25-40
	solution annealed & underaged	1-4	1-3	5-12	...
	fully aged	1-3	1-2	5-12	5-10
	overaged	1-4	1-3	5-15	....
Reduction of Area, %	cast	20-25	18-25	17-25	25-35
	cast & aged	25-35	15-25	10-15	....
	cast & solution annealed	20-30	5-15	18-25	35-40
	solution annealed & underaged	1-3	1-2	5-15	....
	fully aged	0-2	0-1	5-10	5-10
	overaged	1-3	1-2	8-15	....
Izod impact strength, ft lb	cast	65-80	55-70	75-90	70-85
	cast & aged	50-60	40-50	55-65	....
	cast & solution annealed	90-110	20-35	100-110	95-110
	solution annealed & underaged	8-12	6-12	30-50	....
	fully aged	5-11	3-8	30-50	45-55
	overaged	8-12	5-10	40-55	....
Tension impact strength, ft lb	cast	12-17	12-14	....	....
	cast & aged	9-14	9-14	....	....
	cast & solution annealed	12-25	8-15	....	....
	solution annealed & fully aged	3-11	1-3	....	....
Compressive strength (0.001-in. set), psi	solution annealed & fully aged	165-180,000	190-210,000	97-111,000	99-105,000
Endurance strength (10,000,000 cycles), psi	solution annealed & fully aged	20- 30,000	.....	15- 20,000	.....
Electrical Conductivity % IACS	cast	17-22	17-22	32-38	32-38
	cast & aged	19-24	18-22	42-49	42-49
	cast & solution annealed	14-18	10-16	20-24	20-24
	solution annealed & underaged	18-22	15-20	40-45	....
	fully aged	20-25	18-23	45-50	48-53
	overaged	22-27	20-25	47-52	....

Note: Age Hardening Treatments

	20C	275C	10C
Underaged	2 hours at 600° F	1 hour at 550° F	2½ hours at 750° F
Fully Aged	2 hours at 650° F	3 hours at 650° F	3 hours at 900° F
Overaged	2 hours at 750° F	3 hours at 800° F	8 hours at 1000° F

the charge should be melted as rapidly as possible to minimize loss of beryllium and gas absorption. Agitation during melting tends to increase gas absorption and oxidation, so that stirring should be avoided whenever possible. The oxide film formed on the charge prevents further oxidation and should be maintained. Agitation will only break this protective film and distribute oxide through the melt. An exception to this is found in melting with a rocking arc furnace, where agitation aids in reducing the gas content.

Fluxes or slag covers are generally not necessary; however, dry charcoal covers are recommended. Since beryllium serves as a deoxidizer, deoxidants are not required.

Proper control of melting and pouring temperatures are important. Opinions on the advisability of superheating beryllium copper vary. Some foundries point out that superheating provides better chemical uniformity and more time to combat oxide formations, while others claim that the problem of increased gas absorption more than outweighs these advantages.

May Be Superheated

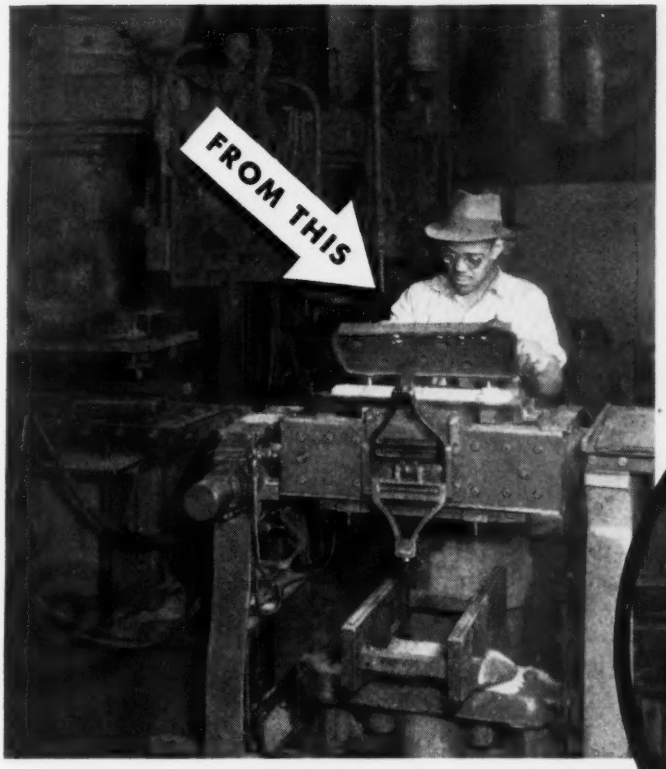
The pouring temperature for 20C alloy ranges from 1900 to 2100° F, depending upon the size of the casting and intricacy of design. When deemed advisable, the metal may be superheated approximately 100° F above the pouring temperature; however, the superheating temperature should never exceed 2150° F for 20C alloy. When the superheating temperature is reached, the metal should be immediately poured into ladles. The metal should not be held in the furnace.

For 275C alloy the pouring range is 1850-1950° F and the metal may be superheated approximately 100° F above the pouring temperature but should not exceed 2000° F. The pouring range for 10C and 50C alloys is 2050-2200° F with a superheat temperature of 2300° F.

Metal should be poured through as short a distance as possible with minimum turbulence. This means that the lip of the pouring ladle should be held close to the sprue and the metal introduced in a continuous stream with no splashing or swirling.

Perhaps the most difficult problem in handling beryllium copper is that it tends to form dross, not unlike aluminum or manganese bronze. This situation is best remedied by close control during melting, although dross

(*Continued on page* 244)



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(*Continued from page* 242)

may also be formed by excessive agitation of the liquid metal in the mold or by sands of high moisture content. Although inverse segregation is the rule, this defect is not pronounced. Other common defects and their remedies follow usual bronze foundry practice.

The safety precautions required for handling beryllium copper in the foundry are similar to those generally employed with bronze—the work area should be well vented and respirators may be advisable.

Processing — Although beryllium copper casting alloys are not free machining materials, they can be readily handled with proper tools, cutting fluids, speeds and feeds in a manner similar to nonleaded tin, silicon or aluminum bronze.[1]

For the high-strength alloys (20C and 275C) castings should be machined prior to heat treatment. Where parts are annealed following casting, it is generally advisable that castings be machined in the solution-annealed condition. The lower hardness of fully heat treated 10C and 50C alloys makes it possible to machine these materials in the hardened condition.

Band or hack saws as well as abrasive cutoff wheels are employed for removing gates and risers. For best results, saw teeth should be well spaced to provide adequate chip clearance and prevent packing. Although rough grinding, including snagging or cutting-off, generally precedes hardening, castings are finish ground after heat treating.

Beryllium copper castings can be satisfactorily joined or repaired by soft soldering, silver brazing, carbon-, metal-, or inert-arc and resistance welding; however, suitable methods have not been devised for bronze brazing or gas-fusion welding.[2] All joining operations—except soft soldering—precede heat treating because the temperatures involved are sufficiently high to rapidly anneal beryllium copper.

Cracked or defective castings can be readily repaired by carbon-arc welding, and this method can also be effectively employed to build up worn surfaces. Aluminum bronze and silicon bronze electrodes may be used for repair welding or for joining beryllium copper to dissimilar metals; however, only beryllium copper rods deposit weld material with properties that approach those of the base metal. When maximum properties are necessary, the assembly or overlay should be solution-annealed, cold peened and age-hardened.

Heat Treatment — The favorable

(*Continued on page* 247)

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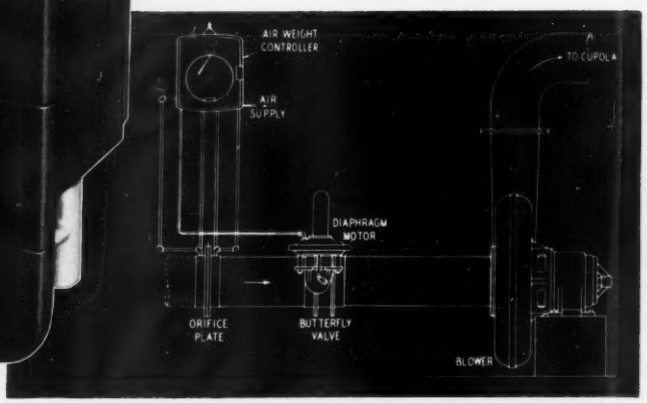

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(*Continued from page* 244)

properties of beryllium copper sand castings are obtained through a two-step thermal treatment. Parts are first solution annealed, which softens the material; followed by low-temperature aging, which hardens these alloys.

For solution annealing, any type furnace permitting adequate temperature control (plus or minus 10° F) is suitable. Castings of the various alloys should be annealed for at least three hours as follows: 20C—1475° F; 275 C—1450° F; 10C—1700° F; 50C—1700° F. Parts are then immediately water quenched upon removal from the furnace. Because most salts attack the surface of beryllium copper rather rapidly at the annealing temperature, salt baths should not be used.

Following solution-annealing, castings may be age hardened in a muffle or recirculating-air furnace. For best results close control of temperature is important. Not only should the range of temperature variation be small (plus or minus 10° F), but heating should be uniform throughout the furnace. The thermocouple should be located so that readings will be representative of the charge. If there is considerable temperature variation within the furnace from one point to another, variations in hardening response can be expected. Salt baths are not recommended for age-hardening, since the irregular shape of castings may make cleaning difficult.

Figs. 1, 2, 3 and 4 show the effect of aging time and temperature on hardness. The following standard age-hardening treatments are recommended, except where special properties may be of greater importance than maximum strength and hardness:

Alloy	Treatment
20C	3 hr at 650°F
275C	3 hr at 650°F
10C	3 hr at 900°F
50C	3 hr at 900°F

These treatments are easy to control, are not critical with respect to time or temperature and produce the highest degree of strength or hardness. After aging, castings may be cooled at any convenient rate to room temperature. It should be noted that in some cases aging temperatures are higher than usually recommended for equivalent wrought alloys.

Where special combinations of properties may be needed, castings may be oil quenched, under-aged or over-aged. For example, over-aging (heat-hardening beyond time required for peak strength) gives higher conductivity and added impact strength

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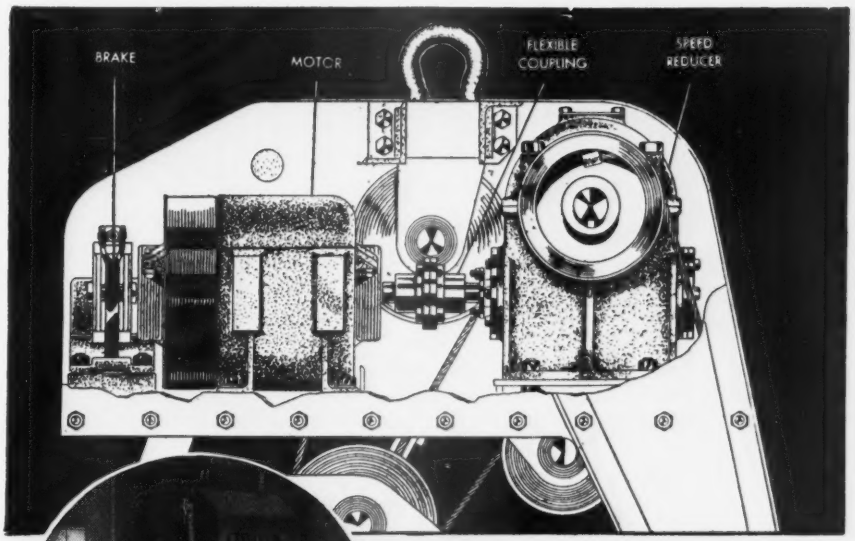

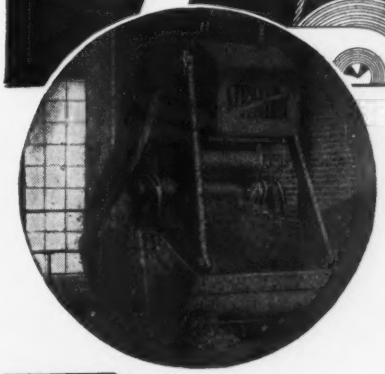

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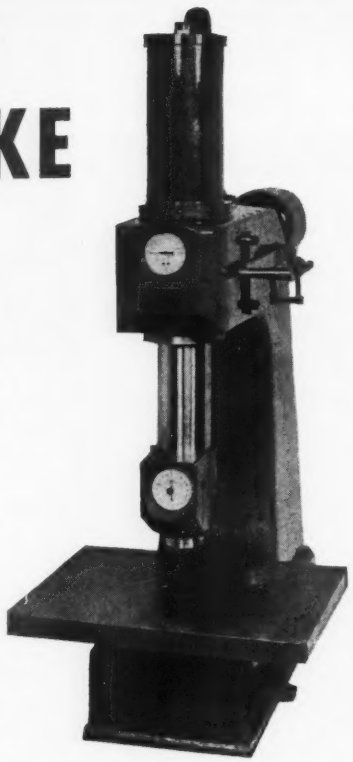

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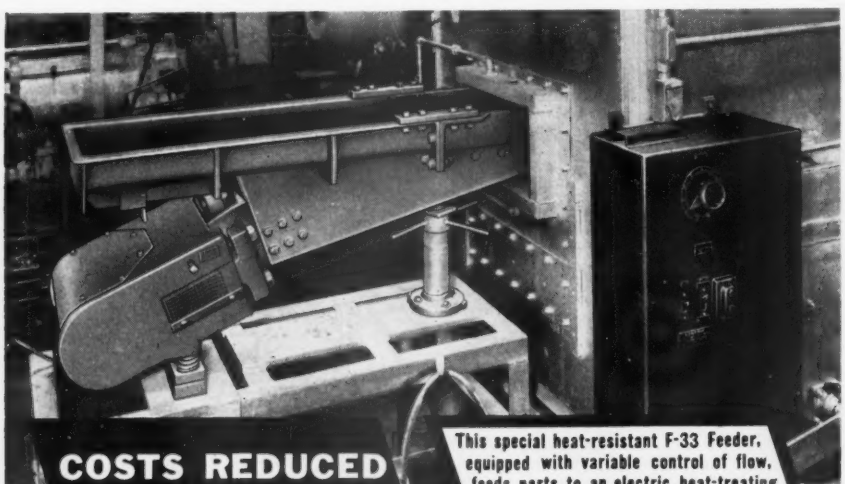
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or resistance to shock with some loss of tensile strength. When large parts are aged, however, it is necessary to use the standard heat treatment to insure uniform heating throughout the section.

Although the solution-annealing treatment is generally recommended, it may sometimes be eliminated where maximum strength is not required. The "cast and heat treated" condition offers time and cost saving opportunities through fewer operations with some loss of final properties. Cast parts are hardened for three hours at 650°F for high-strength alloys (20C and 275C) or three hours at 900°F for high-conductivity alloys (10C and 50C), followed by uncontrolled cooling.

Typical mechanical properties of beryllium copper casting alloys resulting from various conditions and thermal treatments are listed in the section on engineering properties (Table IV).

Controlled or bright atmospheres are generally not necessary for solution or age-hardening beryllium copper, since the slight discoloration caused by heating in an open gas-fired or electric furnace is not detrimental to final properties. For applications requiring a bright finish for appearance or where subsequent machining, welding or plating require a clean surface, the oxide film may be removed by pickling or sand blasting, or may be prevented by heating in a controlled atmosphere.

Surface Finishing—Beryllium copper products can be readily cleaned, polished or buffed in a manner similar to other copper alloys.[3] Sand blasting provides a clean uniform surface and is frequently applied to castings where a dull, rough finish is acceptable. Sand blasting precludes the necessity for pickling and, with or without light buffing, provides the final finish for many items.

When parts are heat treated in air, surface scale can be removed by pickling as follows:

1. Immerse in 20-30 per cent by volume sulphuric acid solution heated to 160-180°F for 15-30 minutes to completely loosen dark scale.
2. Rinse thoroughly in cold water.
3. Bright dip in a 30 per cent by volume cold nitric acid solution for 15-30 seconds to remove all traces of red scale (cuprous oxide) present. Immersion time, which is limited to prevent etching the base metal, is best determined by trial.
4. Rinse thoroughly in hot water and dry.

To insure effective cleaning, it is essential that oil, grease and dirt be

(*Continued on page* 250)

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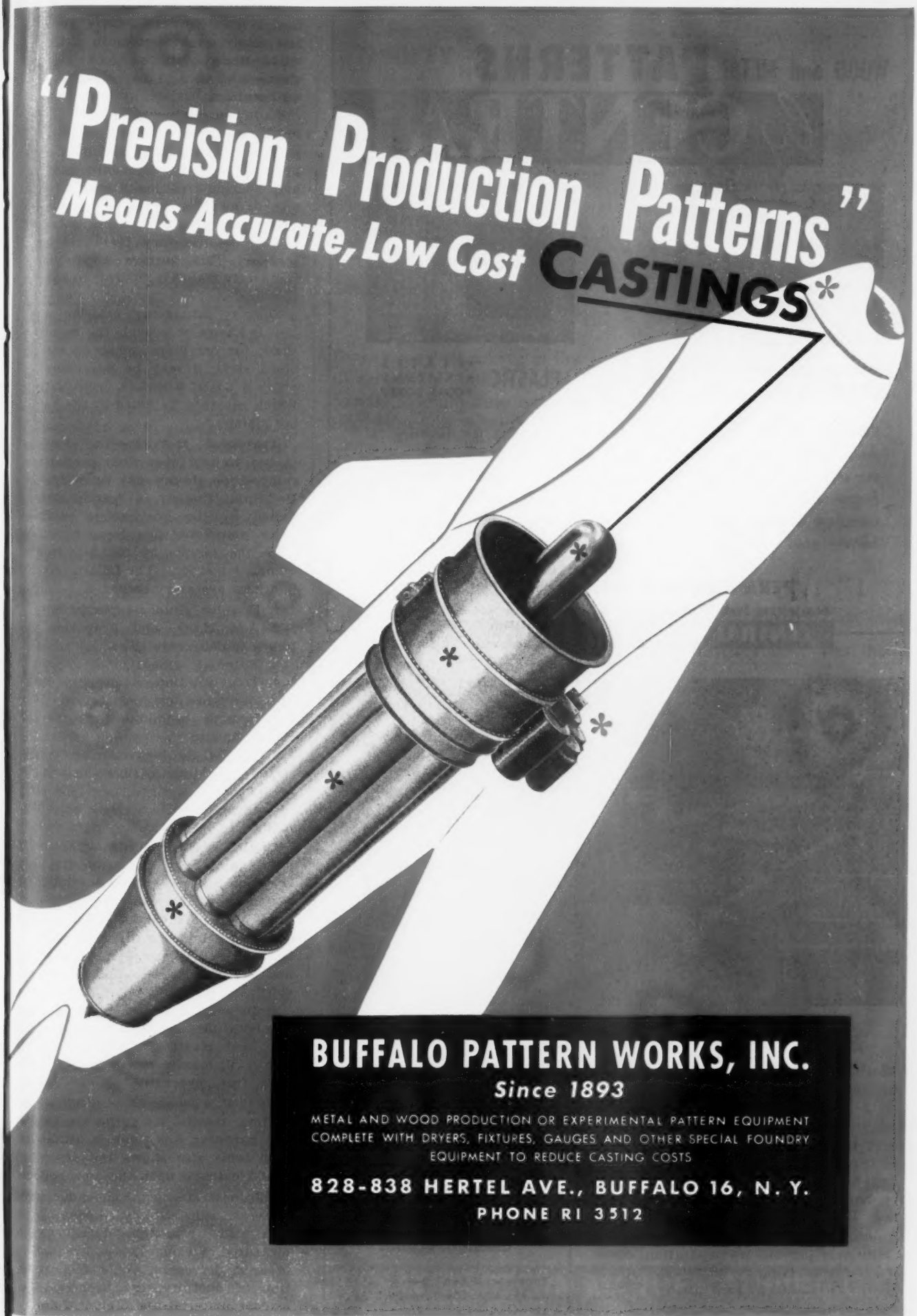

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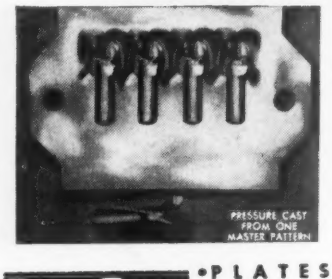

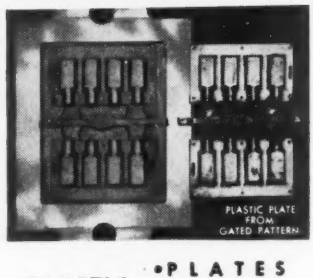

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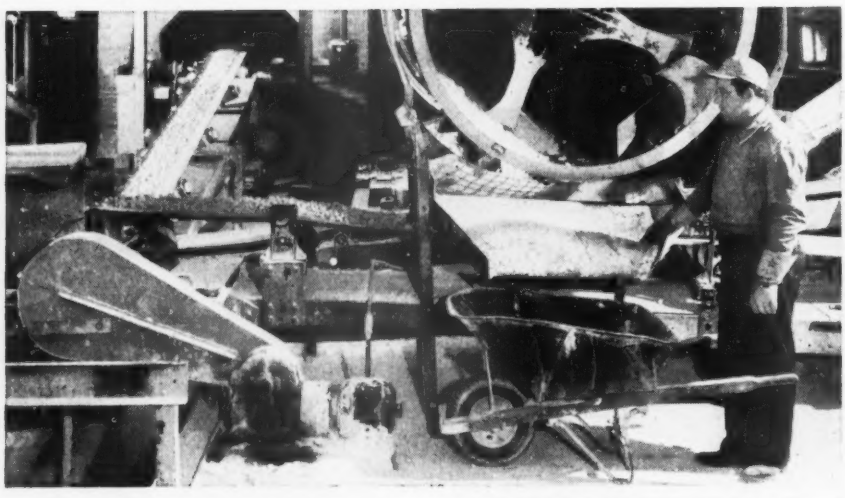

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(*Continued from page* 248)

completely removed prior to pickling, while parts must be carefully cleansed of all acid and dried to prevent staining.

To meet certain service requirements, it may occassionally be necessary to color or plate beryllium copper components. Standard plating and coloring treatments may be employed; however, parts must first be thoroughly cleaned, while a polished surface is necessary to obtain best results. This surface requirement frequently makes it difficult to handle castings.

Since no satisfactory coloring solution is known to provide the required shade for beryllium copper to match blued steel, it may be necessary to apply a 0.0002-0.0003-in. iron plating which can then be blued in the regular manner.

Analytical Methods—To exercise proper control over final properties, composition checks may be desirable. Beryllium content is readily determined by the gravimetric method after aluminum has been removed from the sample by the 8-hydroxyquinoline method. The following outline lists necessary steps:

1. Dissolve clean sample in HNO_3.
2. Add H_2SO_4 and evaporate to fumes to dehydrate silica.
3. Filter off silica.
4. Treat solution on mercury cathode to remove heavy metals.
5. Remove aluminum with 8-hydroxyquinoline.
6. Precipitate beryllium in a filtrate by adding a slight excess of ammonia.
7. Ignite BeOH to BeO at 1100-1200° C.

Engineering Properties—Table III lists typical physical properties for beryllium copper casting alloys in the age-hardened condition. All materials are nonmagnetic, while the densities compare with those of carbon steel or copper. The relatively low melting ranges simplify foundry work.

Both electrical and thermal conductivity increase substantially during heat treatment. As shown in Table IV, maximum conductivity results from overaging.

Typical mechanical properties, including tensile strength, elongation and hardness, are given in Table IV. This table also shows the effect of heat treatment upon these properties.

Hardness, strength and conductivity increase substantially during heat treatment, although ductility, as measured by elongation and reduction of area, decreases. With the exception of ductility, the properties of as-cast material are higher than so-

lution-annealed castings. Upon heat treating, the hardness, strength and conductivity of solution-annealed material reach final values substantially higher than castings hardened directly without the intermediate annealing operation.

In addition, these alloys offer good resistance to wear. In service, beryllium copper has been found to give good results in contact with steel where pressures are high and speeds relatively low, or where bearing surfaces may be subjected to abrasives.

Service temperatures are generally limited to 500° F for high-strength alloys (20C and 275C) or 800° F for high-conductivity alloys (10C and 50C), since prolonged exposure to higher temperatures causes appreciable softening. Fig. 7 shows the loss of hardness for several casting materials held at temperature for 15 hours. The high thermal conductivity in these alloys makes water cooling particularly effective, so that substantially higher temperatures can be endured where adequate provision for cooling has been made.

At low temperatures beryllium copper not only has substantially increased strength compared to room temperature values, but also retains its normal ductility in subzero atmospheres, preventing impact strength reduction or low temperature embrittlement.

Corrosion Resistance—In general, beryllium copper resists corrosion in a manner similar to other high-copper alloys. Under normal conditions it offers good resistance to industrial and marine atmospheres, fresh and salt water, most alkaline solutions, and some acids. Although these alloys in time stain and darken like copper when exposed to humid or sulphur-bearing atmospheres, tarnish does not noticeably affect mechanical properties. The resistance offered to warm and humid air indicates good service in tropical environments.

Beryllium copper has poor resistance to ammonia, sulphur, mercury and many of their compounds. In acids, its behavior greatly depends upon oxidizing conditions, comparing with deoxidized copper in this respect. Increases in temperature, concentration, aeration and agitation usually accelerate corrosion, often to a rather high degree.

Combinations of either static or dynamic loading with corrosion are not harmful unless beryllium copper is subject to direct chemical attack by the corrosive media in an unstressed condition. Consequently, stress-corrosion cracking (season cracking) is not a factor, while the

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combined action of corrosion and alternating stress (corrosion-fatigue) has no effect upon normal endurance properties. In addition, beryllium copper has relatively good resistance to salt water cavitation or erosion[4].

This information is intended only as a guide. Whenever possible, corrosion tests should be conducted under actual operating conditions.

Structure—The high-strength materials (20C and 275C) are, in reality, ternary alloys of copper, beryllium and cobalt. Although beryllium copper alloys were originally binary alloys, commercial materials now contain small quantities of cobalt to inhibit grain growth and provide more uniform hardening response. A recent study of binary alloys by Hildebrandt[5] attributes their inferiority to large grain size and more critical boundary reaction.

The useful properties available in the high-strength alloys (20C and 275C) result from the two-step thermal treatment described previously.

Copper will dissolve about 2.1 per cent beryllium at temperatures in the solution-annealing range (see Fig. 6) with decreased solubility at lower temperatures. Rapid cooling (quenching) from a temperature within the field of maximum solubility will preserve this condition, so that there exists at room temperature a supersaturated solid solution (Metastable alpha phase) with relatively high ductility and relatively low hardness, strength and conductivity. Since only about 0.25 per cent beryllium is soluble in copper in the range 550-750° F, aging at a temperature in this range will cause precipitation of the gamma phase from the unstable solution accompanied by an increase in hardness, strength and conductivity. Beryllium in excess of the 2.1 per cent alpha phase solubility limit forms beta phase, an extremely hard solution consisting of approximately 6 per cent beryllium, balance copper.

Figs. 8, 9, 10 and 11 show the microstructures of 20C alloy in various conditions. The normal cast structure of Fig. 8 includes the three phases resulting from the slow cooling normally associated with sand casting. Beta particles, the last metal to freeze, appear as the sharp light areas. The dark portions are alpha areas of relatively high beryllium content which have precipitated gamma on cooling. The light mottled zones of low beryllium alpha solid solution were the first areas to freeze and contain so little beryllium that only a small amount of gamma has precipitated on cooling.

Fig. 9 shows a typical structure of a casting heat treated for 3 hours

at 600° F direct'y from the cast condition. As indicated above, slow cooling of the casting following freezing causes some hardening through the precipitation of the gamma or hardening phase from areas of the alpha solid solution rich in beryllium. Reheating of the casting in the aging range (500-800° F) produces further hardening and precipitation of the gamma as indicated by the dark areas of the figure. Beta particles still appear light.

Heating the casting in the solution-annealing range (1400-1500° F) gives the microstructure of Fig. 10. Prolonged heating in this range permits diffusion to redistribute the beryllium, leaving a more uniform alpha phase (gray) without appreciably affecting the beta particles. Quenching preserves this structure at room temperature.

Aging the solution-annealed casting at 600° F gives the structure shown in Fig. 11. Three phases are indicated: The white beta particles and the dark gamma precipitated from the alpha matrix. The higher properties of the solution-annealed and age-hardened condition result from the more efficient precipitation of the gamma or hardening phase from a more uniform alpha matrix.

No attempt will be made to discuss the mechanics of the hardening operation, since considerable research has been devoted to this phenomenon without agreement among investigators. Whether hardening precedes or is concurrent with the separation of the gamma phase is mainly of academic interest in present-day practice.

For the high-conductivity alloys (10C and 50C) heat-treating temperatures are higher, so that the solution-annealing zone runs from 1650-1700° F and the age-hardening range from 700-1000° F.

Applications—As previously mentioned, beryllium copper parts are regularly produced by sand, permanent mold, pressure, plastic mold and investment casting techniques[6]. In selecting the best foundry method for a given application, the choice must be consistent with economy and performance requirements.

Sand castings frequently offer the lowest cost for simple shapes requiring a minimum number of finishing operations and may provide the only feasible means of producing large parts. Sand castings are limited in size only by available melting and handling facilities. In addition, this method may present economies for short runs where expensive patterns or tooling are needed for other production techniques.

On the other hand, permanent mold

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1930— First commercial use of gamma rays; radiograph made of sternpost of cruiser "Chester".

1935— First purchase of radium for industrial radiography by Westinghouse; bought from Radium Chemical Co., Inc.

1938— AFA questionnaire revealed that 8% of steel casting men used radium radiography.

1941— 22% of steel casting men bought, rented, leased or employed radium for radiographic purposes.

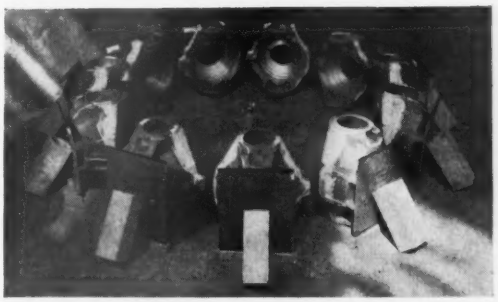
1946— 150 steel foundries rented or leased radium.

1947— American Society for Testing Materials issued Radiographic Standards for Steel Castings. (Gamma Ray). E71-47T.

1948— 200 steel foundries rented or leased radium.

1949— Revision of the U. S. Navy Universal Exposure Calculator for Radium Radiography by N. A. Kahn, E. A. Imbembo and J. Bland, New York Naval Shipyard, Brooklyn, N. Y.

1950— 250 steel foundries rented or leased radium.



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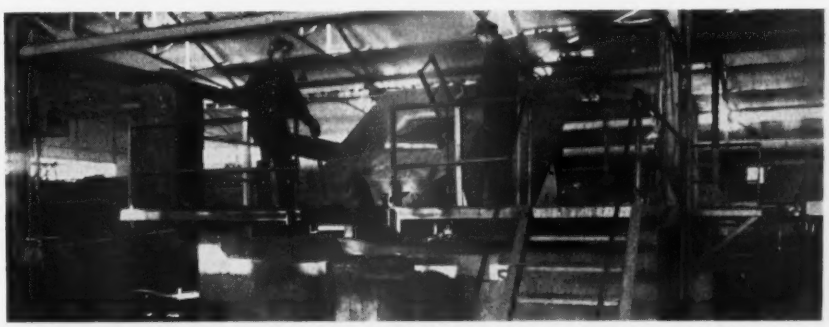

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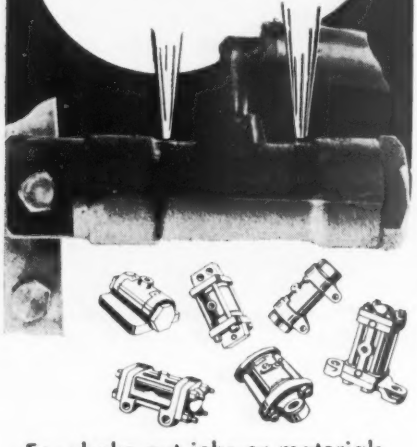

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work is generally restricted to long runs, while pressure castings are employed chiefly as molds for plastics or die castings. Plaster mold and investment castings find use as small and intricate parts which could not be sand cast with sufficient precision and would require expensive machining to obtain needed detail.

Design considerations for beryllium copper sand castings follow manganese, aluminum or silicon bronze practice, except that some allowance should be made for the slightly lower shrinkage of beryllium copper. In addition, the higher strength and conductivity of beryllium copper makes possible lighter sections with important savings in size and weight.

20C Alloy—This casting version of the standard 2 per cent wrought alloy, offers special advantages in sand casting through good fluidity, low pouring temperatures and high final properties after hardening. Its high strength and resistance to wear and corrosion makes it especially suitable for critical mechanical parts including cams, bushings, scraper blades, bearings, gears, sleeves and pump and valve parts. Cast aircraft hinges serve as a typical application of this type, since beryllium copper provides the necessary castability plus resistance to high stresses, corrosion and vibrational fatigue. This alloy also offers special advantages in the production of marine propellers through high strength and excellent resistance to erosion and cavitation[4].

Suitable for Dies

By virtue of high hardness, good wear resistance and exceptional compressive strength, 20C alloy is finding increased use as sheet metal forming, drawing and blanking dies for producing stainless steel and other ferrous products. These same characteristics combined with good thermal conductivity give long life in die casting machine plunger tips, particularly where adequate facilities for water cooling are available.

This alloy also meets the requirements of RWMA Class 4 resistance welding materials, and finds application where an alloy harder and stronger than Class 3 is necessary. It is employed extensively for flash welding dies in joining steel strip and sheet for continuous pickling or heat treating, as well as bottom dies in barrel seam welders. With the introduction of fully automatic flash and butt welding machines, higher operating pressures are the rule and require harder materials. In a typical machine tool application, 20C sand castings have been successfully used as a switch lever and latch on the

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indexing mechanism of an automatic screw machine.

Cast beryllium copper safety tools find use in locations made hazardous by the threat of fire or explosion. These tools are relatively nonsparking; are corrosion resistant and nonmagnetic.

275C Alloy—This is a special purpose foundry material designed for plastics molds and other applications requiring maximum hardness and wear resistance. Of recent significance is the development of 20C alloy wire straightening dies, since their unusual wearing qualities insure longer life in straightening finished stainless steel wire.

May Be Cast in Sand

Although pressure casting plays an important role in the plastics mold field, sand-cast cavities and forces may prove economical where few molds are needed or sizes exceed those normally handled by pressure casting[7]. In many instances cast beryllium copper molds give decreased tooling and production costs, and their good thermal conductivity means high production rates. The excellent castability of 20C alloy yields molds with relatively smooth surfaces and good detail. Tolerances of the order of plus or minus 1/64-in. can be held over most dimensions. Although the quality of these molds does not equal that of pressure castings, sand casting may offer the lowest cost for certain noncritical applications.

10C Alloy— This casting alloy is used for parts requiring good electrical and thermal conductivity combined with moderate strength and hardness. It offers the best resistance of any copper-base casting material to elevated temperatures, giving good service with no appreciable loss of hardness up to 800° F. By virtue of these properties, this alloy is especially suited for switch parts, slip rings, heavy contacts or springs and similar current-carrying components. High thermal conductivity coupled with good wear resistance suggests successful application in certain types of friction members.

Perhaps the most successful application of this material to date has been in heavy electrical equipment. Instead of employing separate current-carrying and spring members, it is frequently possible to combine these functions in a single 10C alloy part. Outstanding examples include the main contact arms of air circuit breakers and the jaw contacts on air-break disconnecting switches. In addition to strength and conductive requirements, 10C alloy also delivers

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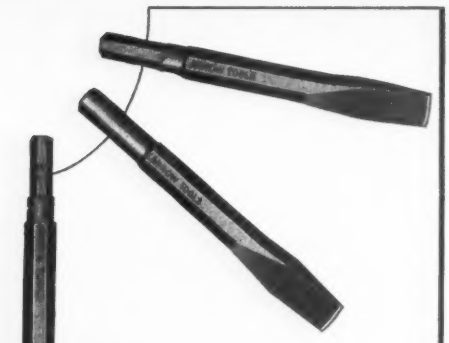

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the elastic and impact qualities needed in these exacting applications.

Although this material is still extensively employed as a resistance welding electrode material, it is being largely replaced by 50C alloy where cast RWMA Class 3 materials are specified.

50C Alloy—This high-conductivity alloy was especially designed for resistance welding dies and electrodes (RWMA Class 3). On account of its good conductivity, hardness and resistance to heat checking, mushrooming and sticking, it is finding increased use for sand-cast welding jaws, resistance welding dies and electrode holders, particularly where size and shape requirements prevent economic use of wrought materials. The added hardness of 50C alloy compared to RWMA Class 1 (cadmium copper) and Class 2 (chromium copper) presents special advantages in successfully handling the higher pressures encountered in resistance welding stainless steel and similar products.

References

1. J. T. Richards, *American Machinist* 93 (Feb. 10, 1949) 101-116.
2. J. T. Richards, *Welding Engineer* 35 (June 1950) 23-27, (July 1950) 36-39, (Aug. 1950) 35-37.
3. J. T. Richards, *Materials & Methods* 31 (April 1950) 75-90.
4. W. C. Stewart and W. L. Williams, *Proceedings*, ASTM 46 (1946) 836-845.
5. V. D. Hildebrandt, *American Foundryman* 18 (Sept. 1950) 34-37.
6. J. T. Richards, *Materials & Methods* 30 (Sept. 1949) 70-73.
7. R. A. Burkett and J. T. Richards, *Modern Plastics* 27 (Dec. 1949) 99-101, 104, 106.

ASM Names New Officials

At its annual meeting the nominating committee, American Society for Metals, Cleveland, named these officials and trustees for 1951-52: Dr. John Chipman, head department of metallurgy, Massachusetts Institute of Technology, president; Ralph L. Wilson, director of metallurgy, Timken Steel & Tubes Division, Timken Roller Bearing Co., vice president, and Ralph L. Dowdell, head, Department of Metallurgy, University of Minnesota, treasurer.

New trustees are George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., and J. B. Johnson, chief of materials division, Wright-Patterson Air Force Base, Dayton, O.

The ASM board of trustees for 1951-52 will include, in addition to Messrs. Roberts and Johnson: J. B. Austin, director of research laboratories, U. S. Steel Co.; Dr. James T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co.; Walter E. Jominy, staff engineer, Chrysler Corp.; Dr. Chipman; Mr. Wilson; Mr. Dowdell, and W. H. Eisenman, who will serve as ASM national secretary.

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OPS Names Nonferrous Advisory Group

Members of the Nonferrous Casting Industry Advisory Committee recently appointed to advise officials of the Office of Price Stabilization on problems of their respective industries for consideration in regulation of prices are:

A. C. Runnette, Aluminum Co. of America, Pittsburgh; Grant Roth, Ace Foundry Co., Chicago; B. D. Claffey, Acme Aluminum Alloys, Dayton, O.; Anthony Cristello, America Light Alloys Inc., Little Falls, N. J.; Otto G. Gundel, Buckeye Brass & Mfg. Co., Cleveland; H. C. Fechtmeyer, Ampco Metal Inc., Milwaukee; Frank J. Halligan, Baldwin-Lima-Hamilton Corp., Philadelphia; T. W. Pettus, American Brake Shoe Co., St. Louis; William A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland; Fred H. McCullough, Springfield Bronze & Aluminum Co., Springfield, Mass.; Fred H. Buckingham, Sandusky Foundry & Machine Co., Sandusky, O.; C. E. Piper, Erie Bronze Co., Erie, Pa.; F. V. Wilson, Standard Brass & Mfg. Co., Port Arthur, Tex., and R. H. Osbrink, R. H. Osbrink Mfg. Co., Los Angeles.

Honor Company Veterans

Independent Pneumatic Tool Co., Aurora, Ill., initiated 166 veteran employees into its new 25 and 50-year clubs, May 14. One hundred forty of the veterans were present for the inaugural dinner at the Leland Hotel, Aurora. Neil C. Hurley Jr., Thor president, awarded engraved electric clocks and charter membership certificates to all veterans and television console sets to each of the two 50-year employees. They are William Lange, tool room machinist, 58 service years, and Dominick Kellon, inspector, 51 years.

Book Review

Transactions of the American Society for Metals, cloth, 1280 pages, 6 x 9 in., published by the American Society for Metals, 7301 Euclid Ave., Cleveland.

This volume 43 of the *Transactions,* 1951, contains the technical program and reports of officers relating to the 32nd annual convention of the American Society for Metals held in Chicago in October, 1950. In addition it carries the context and discussions of some 50 papers which were presented at the convention, and includes the Campbell Memorial lecture given by E. C. Smith on "Iron Ore Smelting Problems."

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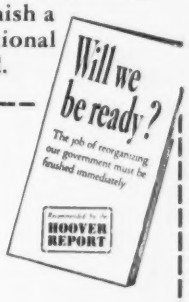

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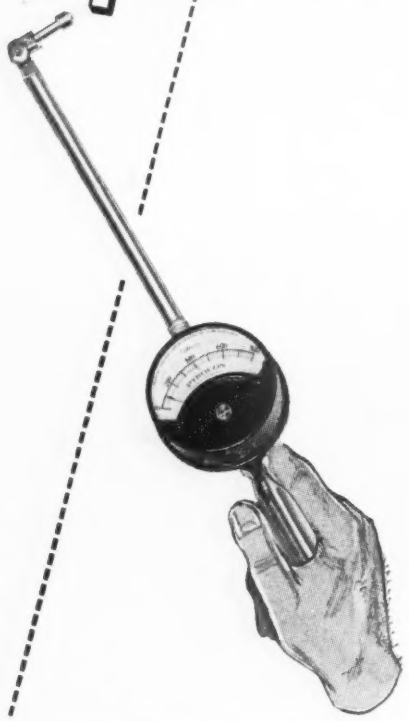

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SPEED REDUCERS: Dodge Mfg. Corp., Mishawaka, Ind. — Illustrated bulletin A-470, covering double reduction speed reducers, and bulletin A-602, covering single reduction reducers, give data in tabular form to assist in selecting the right reducer for any installation when horsepower requirements and the speed and size of shaft to be driven are known.
For More Details Circle No. 90—Page 217

NICKEL SILVER: R. Lavin & Son Inc., 3426 South Kedzie Ave., Chicago 23—A paper dealing with nickel silver, also known as nickel brass and nickel, bronze, is published in the *Lavingot*, Vol. 6, No. 4. The paper presents photographs of castings, sketches of gating and risering procedures, and a description of proper foundry practices for producing sound castings from this alloy.
For More Details Circle No. 91—Page 217

METAL: Cooper Alloy Foundry Co., Bloy & Ramsey Ave., Hillside 5, N. J.—Booklet contains information on the production of cast Monel and its physical and mechanical properties. Its use in handling acids and alkalies, and its machinability and weldability are discussed. Charts show corrosion resistance to various materials.
For More Details Circle No. 92—Page 217

INSTRUMENTS: Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne & Windrim Aves., Philadelphia 40—Catalog 15-15 covers electric control potentiometers for both contact and proportional control. Engineering and constructional data, types of control, partial list of available ranges, application data, and accessories are described.
For More Details Circle No. 93—Page 217

WATER-SAND BLAST: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Bulletin 1110 illustrates and describes how a stream of mixed sand and water is applied to core knockout and casting cleaning. Specifications and drawings of two standard water-sand blast machines are included.
For More Details Circle No. 94—Page 217

VISCOSITY CONTROL: Fischer & Porter Co., 4030 County Line Rd., Hatboro, Pa.—Catalog 88 covers instruments that provide an instantaneous method for determining viscosity values for industrial processes and for continuous viscosity measurement and control.
For More Details Circle No. 95—Page 217

HANDLING EQUIPMENT: Clark Equipment Co., Industrial Truck Divison, 258 Champion St., Battle Creek, Mich. — "Material Handling News," Vol. 9, No. 1, features the company's Dynatork Drive which transmits engine power to the drive axle by magnetic induction, across an air gap; its various models of electric and gasoline powered trucks, and a number of new attachments for special handling needs of various industries.
For More Details Circle No. 96—Page 217

SHOT: Cleveland Metal Abrasive Co., 880 East 67th St., Cleveland 8—Folder covering cut wire steel shot for cleaning and peening operations presents statistics to support claimed advantages of this type shot.
For More Details Circle No. 97—Page 217

VACUUM CLEANERS: Spencer Turbine Co., 503 New Park Ave., Hartford 6, Conn.—Bulletin 125D, covering the company's industrial vacuum cleaners, contains illustrations and descriptive literature on a number of installations.
For More Details Circle No. 98—Page 217

MILLS: Severance Tool Industries Inc., 2682 Orange St., Saginaw, Mich. —Catalog lists company's most popular midget mills, junior mills, deburring cutters, countersinks and reamers. Specifications and prices are included.
For More Details Circle No. 99—Page 217

VIBRATORS: Cleveland Vibrator Co., 2789 Clinton Ave., Cleveland 13—Illustrated folder F-351 covers company's line of foundry type vibrators. Information as to sizes, types, mounting data and prices is included.
For More Details Circle No. 100—Page 217

METALLIZING: Metallizing Co. of America, 3520 West Carroll Ave., Chicago 24—Bulletin tells how the metallizing process aids in fighting corrosion, rebuilding worn parts, and reclaiming mismachined castings.
For More Details Circle No. 101—Page 217

SAFETY KIT: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Kit contains operators' guides and brightly hued posters, emphasizing safe fork lift truck operation through eye-catching cartoons.
For More Details Circle No. 102—Page 217

FLOOR MATERIAL: Monroe Co., 10703 Quebec Ave., Cleveland 6—Bulletin C41-1 lists features and technical information of a resurfacing and patching material for concrete floors.
For More Details Circle No. 103—Page 217

PLANERS: Oliver Machinery Co., 1025 Clancy Ave. N.W., Grand Rapids, Mich.—Illustrated folder presents data on the company's single and double surface planers.
For More Details Circle No. 104—Page 217

BORING MACHINE: Forney's Inc., New Castle, Pa.—Illustrated catalog provides full details on a horizontal floor type boring, facing, drilling, and milling machine.
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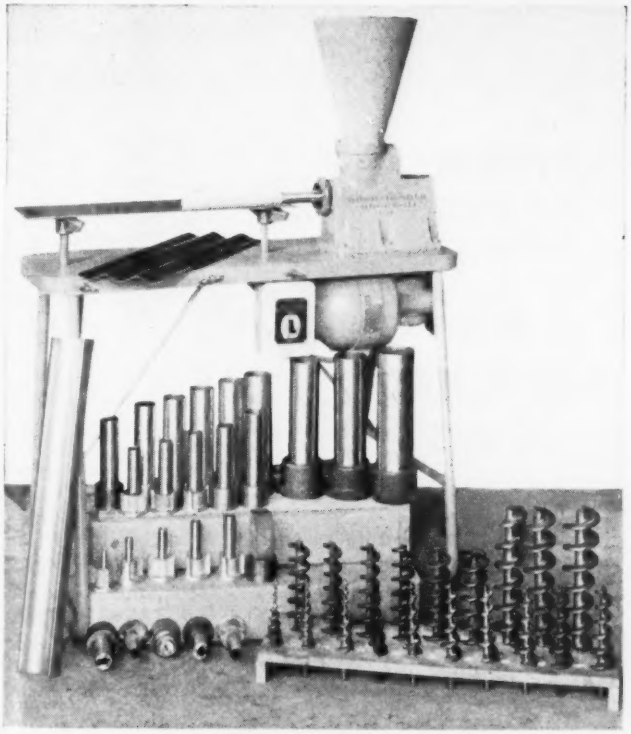

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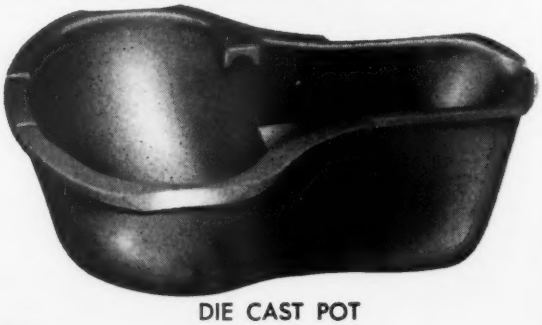

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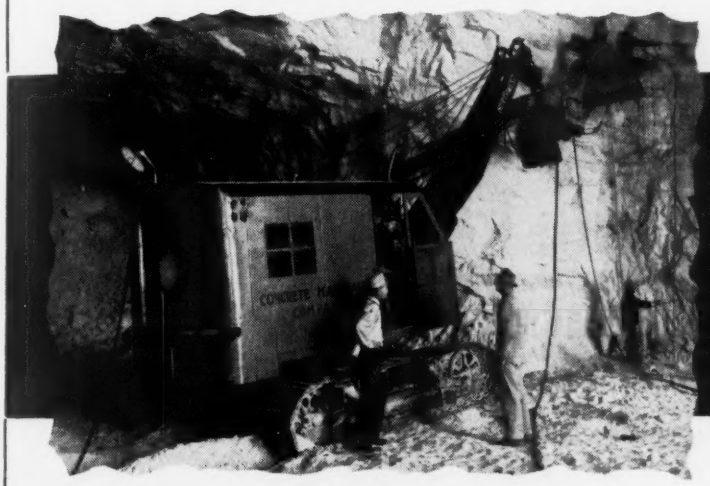

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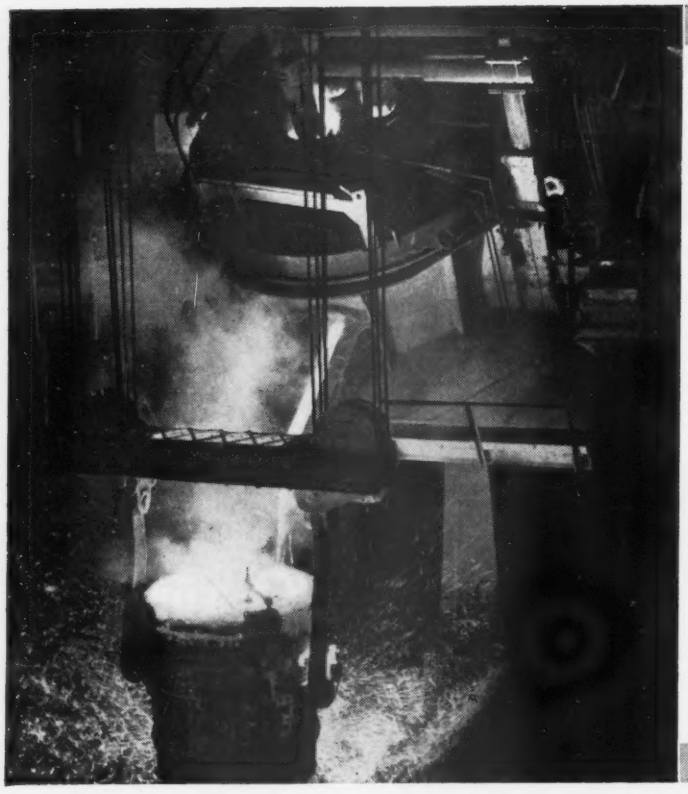

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MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

TERRE HAUTE SPECIAL FOUNDRY COKE

★

A QUALITY PRODUCT

Sold Exclusively by

REPUBLIC COAL & COKE CO.

8 South Michigan Ave., Chicago 3, Illinois

BRANCHES: Peoria • New York • Indianapolis • Milwaukee • Minneapolis • St. Louis
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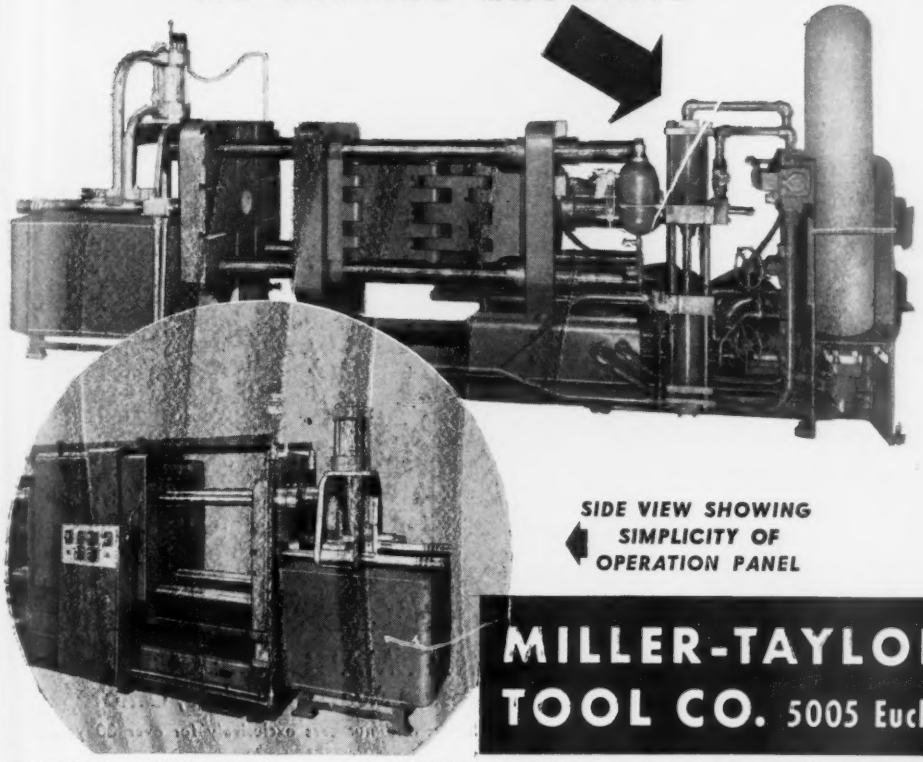
Manufactured at Terre Haute, Indiana by INDIANA GAS & CHEMICAL CORPORATION

New Hydraulic System makes CAST-MASTER Safest in Industry

DIE CASTING MACHINES



SIDE VIEW SHOWING SIMPLICITY OF OPERATION PANEL

. . . ELIMINATES FIRE HAZARDS!

Another Miller-Taylor achievement that makes the new CAST-MASTER die casting machines the safest in the industry. The new closed hydraulic system uses either soluble or a nonflammable oil instead of hydraulic oil to eliminate fire hazards on the shot end of the machine. Telescopic Fluid Transmission assemblies to hydraulic ejection die lock and shot cylinder eliminates all hose and flexible piping—thus offering an additional safety feature. For complete safety protection and maximum operating efficiency you'll find it hard to match the newly improved CAST-MASTER!

Write For Complete Specifications!

MILLER-TAYLOR TOOL CO. 5005 Euclid Ave., Cleveland 3, Ohio

Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

TELLURIUM

Comes in 1, 2, 3 and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 8-page article. "Use of TELLURIUM In Promoting Chills On Gray Iron Castings."

American Smelting and Refining Company

120 BROADWAY • NEW YORK 5, N.Y.

Experience with this chaplet ~

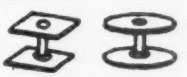
PROVES BETTER HOLDING POWER.

When you pack sand, there is no loose spot under the head and around stem of this patented shoulder radiator chaplet. Better packed sand gives chaplets and cores better support, reduces casting rejects.

WRITE FOR BULLETIN

CLEVELAND CHAPLET & MFG. CO.
1197 W. 67th St., Cleveland, Ohio

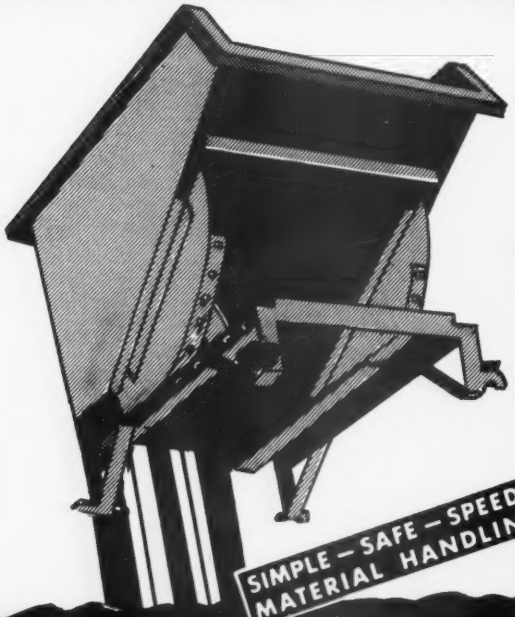
We also make MOTOR CHAPLETS



BOILER CHAPLETS, FORGED HEAD CHAPLETS, FITTED HEAD CHAPLETS, DOUBLE HEAD CHAPLETS and other types.

CLEVELAND Chaplets
Since 1890

Use Self-Dumping Containers



SAVE MANPOWER
while
STEPPING UP
PRODUCTION
with
ROURA Self-Dumping HOPPERS

Only ROURA Has the Exclusive Instant Release (Patent Pending) Handle

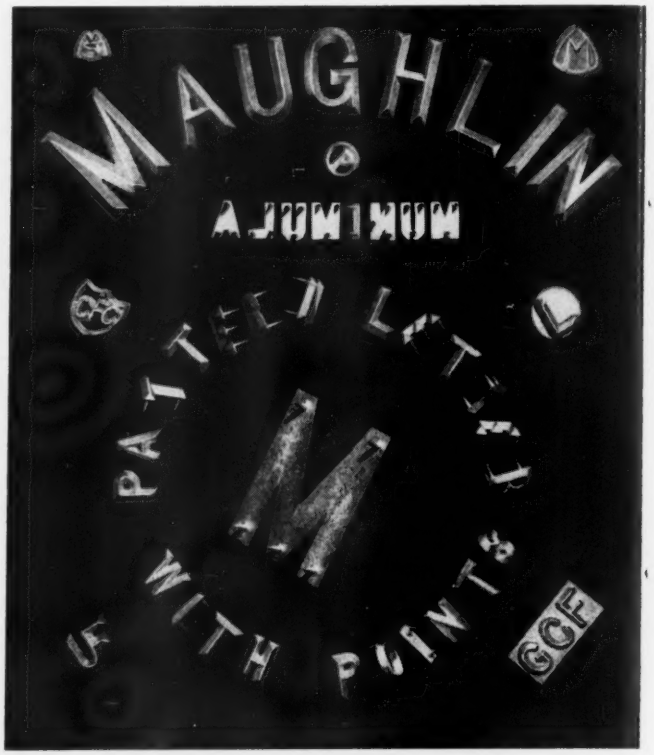
Handling wet or dry, hot or cold, bulky materials quickly and easily, the ROURA is simple to operate—only one man is required for distributing and unloading—and he does this in much less time than ordinarily required under old-fashioned manual methods. Thousands of Roura Hoppers (which fit any standard fork or platform lift truck) are in constant daily operation, serving and saving for such firms as Owens-Illinois Glass, Corning Glass, National Fireproofing, General Motors, Ford, Chrysler, American Brake Shoe, General Electric, Westinghouse, Western Electric, American Steel Foundries, International Harvester, John Deere, etc.

By a simple lift of the exclusive release handle, the ROURA HOPPER dumps, rights and locks itself securely. Sizes—½, ¾, 1, 1½ and 2 cubic yards; the ROURA HOPPER can also be designed for flat trucks and in other sizes to meet specifications. Also, it can be equipped with special flanges that permit stacking to desired tiers for storage or future distribution of materials—conserving valuable floor space. Priced below all competition, the ROURA will quickly pay for itself many times over.

Write today for detailed brochure.
"You Can Save 50% Labor-Time"

ROURA IRON WORKS, Inc.
1417 Woodland Ave. Detroit 11, Mich.

A Hammer Blow Secures Letters To Pattern



THE H. P. MAUGHLIN CO.
953 Ingleside Ave., Columbus, Ohio
Manufacturers of letters and numbers exclusively for over 30 years

FASTER, BETTER MIXING
Lowers Your Operating Cost

7-cubic foot mixer with screen raised

Mix core and molding sands, and cupola patch mixes with MULTI-BLADE MIXERS

- THEY'RE FAST . . . mix and discharge a load in four and a half minutes.
- THEY MIX BETTER . . . the best blade arrangement in any mixer . . . cuts, turns and kneads the mix ten times with every shaft revolution.
- THEY'RE QUALITY BUILT . . . trouble free, self-contained, have anti-friction bearings, direct drive (no clutch or belts), and come in sizes from 3 to 60 cu. ft. capacities. Special and larger mixers also available.

Get these advantages and resultant savings. See your foundry equipment dealer or write direct to

MULTIPLEX MACHINERY CORP. ELMORE OHIO

PHILADELPHIA COKE

PHILADELPHIA COKE COMPANY

4501 Richmond St.

Philadelphia 37, Penna.

PHONE: DELAWARE 6-3100

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Producers of

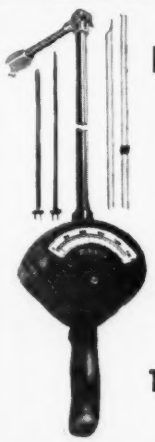
FOUNDRY • METALLURGICAL

INDUSTRIAL COKE

Measure Foundry Temperatures Accurately . . . at a glance!

Use the Simplified PYRO Optical Pyrometer

Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Completely self-contained—no calibration charts or accessories needed. An accurate, DIRECT-READING instrument that will pay for itself many times over by helping prevent spoilage. Weighs just 3 lbs. Available in 5 ranges (1400° to 7500° F.) *Write for FREE CATALOG #80, today!*



For Non-Ferrous Foundries . . . the PYRO IMMERSION PYROMETER

Helps insure low-cost production of SOUND, UNIFORM Castings. Has shielded steel housing which is shock-proof, dust-proof and moisture-proof—withstands roughest handling. "Protected Type" and "Bare Metal" thermocouples are instantly interchangeable, without adjustment or recalibration. Large 4-inch easy-reading dial. Equipped with exclusive LOCK SWIVEL. Available in 6 ranges (1000°F to 2500°F). *Write for FREE Catalog #150*

THE PYROMETER INSTRUMENT CO.

New Plant & Lab.

Bergenfield 6, New Jersey

Barber-Greene Company *Says*

"COLES CRANES increased the efficiency of our stock handling operations"

AND —

"During the time that this new crane has been in use, it has proved most valuable in our material handling problem. It is being used to pick up subassemblies from outside storage and transport them to our Assembly Department. We have found three features of this machine to be especially valuable in our work; these are,

- *1. The ability to swing the full 360° without loss of load lifting power.*
- *2. Conventional steering in all directions.*
- *3. The automatic safe load indicator.*

The third point mentioned has been especially valuable, since it gives us automatic control over the operation of the unit."

Symbol of the finest in material Handling Equipment for over 70 years.

WRITE FOR BROCHURE

COLES CRANES

COLES CRANES, INC.

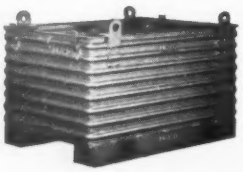
The name that carries weight in Material Handling

4318 S. Paulina St. Chicago 9, Ill.

Here's why

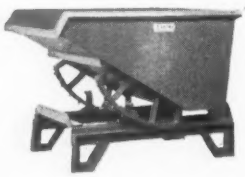
rugged BRUSCO handling equipment increases foundry efficiency

BRUSCO CORRUGATED STEEL BOXES



Save floor space — stack safely from floor to roof. Four way entry for fast, efficient handling. Equipped with crane lugs for movement by crane. Fabricated from heavy gauge corrugated steel to give added rigidity and maximum strength. Thoroughly and securely arc welded for longer, maintenance free life. Made in various sizes and load capacities to suit your requirements.

BRUSCO SELF-DUMPING HOPPER



Speeds production and saves labor in handling parts and materials in your foundry. Easy to move and simple to operate. Hopper is fabricated of heavy steel plate thoroughly reinforced. This unit is equipped with a new, cast steel rocker and hardened pins for longer service. Made in ½, 1, 1½ and 2 cubic yard capacities. Underclearance optional.

BRUSCO CASTING COOLING BOXES

Shortens cooling time. Stacks quickly, safely and saves vital floor space. Made in sizes and load capacities to fit your particular requirements.

These are only a few of the *Standard* items in the complete BRUSCO material handling line for foundries. These and the many other BRUSCO units can be built to meet your specific needs. Remember, every BRUSCO material handling unit is built to speed, simplify and ease your Foundry materials handling. Write today for full information.

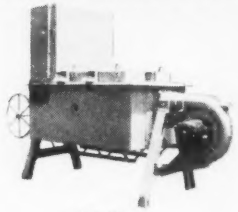
Brusco

HANDLING EQUIPMENT

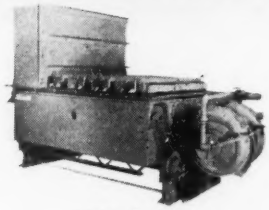
BRUMMELER STEEL PRODUCTS CORPORATION

1412 Ionia Ave., S. W. Grand Rapids, Michigan

SUPERIOR PERFORMANCE



400 Series



1000 Series

Reda Stack-Loading melting furnaces for ferrous and non-ferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive, types; that is why, with Reda furnaces there is less down time for maintenance, longer, uninterrupted melting runs, and lower melting costs.

Another feature is the Reda Burner arrangement which can operate from oil and gas simultaneously or be switched from one fuel to the other instantly.

Write or phone for complete details.

	CHARGE		MAX. MELT. CAP./HR.	
SERIES	IRON	BRASS	IRON	BRASS
400	400#	450#	1000#	1350#
550	550#	625#	1375#*	1850#
1000	1000#	1125#	3000#	4000#

LARGER MODELS ON REQUEST

STACK LOADING

DIRECT FIRED—REFLECTING TYPE

REDA FURNACE

REDA PUMP CO. Bartlesville, Okla.

COLOR YOUR CORE SANDS

Modern foundries have found it practical to color their various grades of core sands. This eliminates guesswork and assures the proper use of the required type of core sand for the particular job at hand.

Our laboratories have developed a line of special dyes in a range of colors that have been carefully tested and found suitable as well as economical.

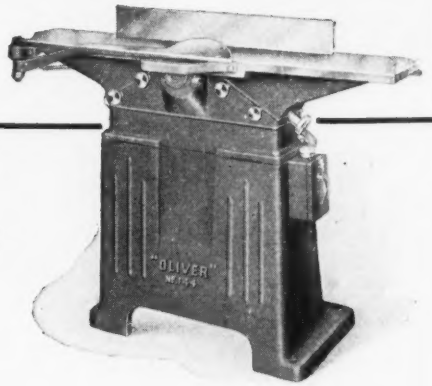
Write us for details and samples.

EATON CHEMICAL AND DYESTUFF COMPANY

1490 Franklin Street Established in the year 1838 **Detroit 7, Michigan**

Canadian Branches: Windsor and Toronto

"OLIVER" 8-inch Hand Planer & Jointer



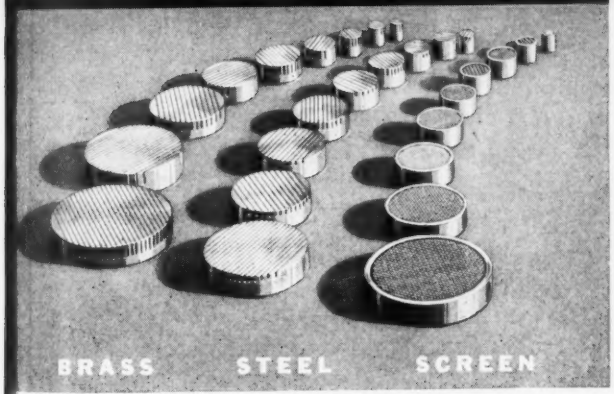
This heavy-type Jointer saves patternmakers' time planing stock quickly, accurately

A handy, fast machine for the pattern department. Work slides easily over the 60-inch polished tables. Circular safety cylinder runs in self-aligning double row ball bearings. Bevel fence adjustable from square to 45° across table. Table lowers for rabbeting up to ½-inch. Has new automatic knife guard for utmost safety. Write for Bulletin No. 144BD.

● *"Oliver" makes a full line of Jointers from 6" to 30".*

OLIVER MACHINERY CO., GRAND RAPIDS 2, MICH.

PRECISION CORE BOX VENTS



You can depend on the quality that is built into every Demmler Core Box Vent. All orders are promptly filled from stock.

SLOTTED VENTS
(Available in Brass or Steel)
Slot Widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8" 1", 1 1/4", 1 1/2"

STAINLESS STEEL SCREEN VENTS
Mesh: #30, #40, #50
Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

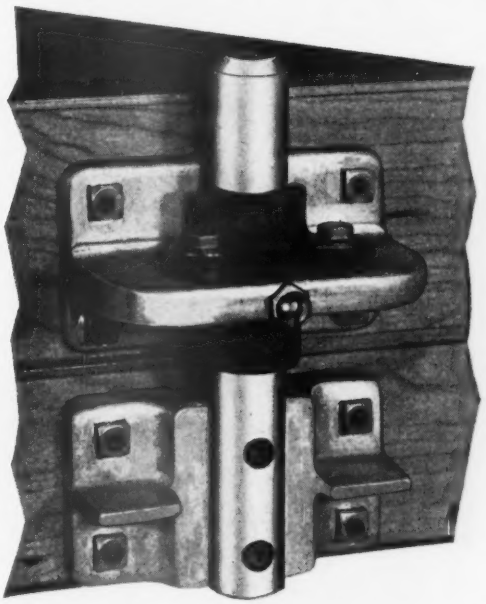
ILLUSTRATED FOLDER ON REQUEST

Wm. DEMMLER & Bros.
Kewanee, Illinois

V-G CHERRY SNAP FLASKS

Featuring the

V-G ROUND PIN ASSEMBLY



ONE INCH ROUND STEEL PIN HARDENED and RUSTPROOF DOUBLE LIFE—REVERSIBLE

REMOVE CAP SCREWS AND ROTATE PIN 180 DEGREES.

ALUMINUM PIN BASE AND COPE EAR ADJUSTING SCREW FOR COPE GUIDE

V-G Flasks are seasoned cherry with new hook-type latches that never loosen. Adjustable hinges are screwed AND bolted to the flask. Wear strips of either steel or HARDENED-24ST- Aluminum are available. Other standard pins also available.

Shipments can be made promptly

Write for complete information

Correspondence invited from Distributors

V-G FLASK & FITTING CO.
MADISON, CONNECTICUT

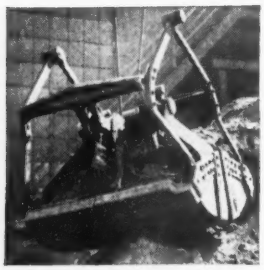
These Four BLAW-KNOX *Buckets* Help Solve Your Rehandling Problems

"SHARK TOOTH" Single-Line Hook-On Buckets

HERE'S the answer to the problem of handling coke and sand . . . simply by adding or removing liner plates, the *same* dual purpose Blaw-Knox Bucket handles both, with minimum degradation of coke and without sand leakage! The illustration at the upper right shows an open head type Single-Line Hook-On Bucket, rated 1 cubic yard, with liner plates applied inside of the shark teeth for handling sand, coal, small limestone and granular fines. Illustrated at the right is a closed head type 1 cubic yard Shark Tooth Bucket without liner plates for coke handling.

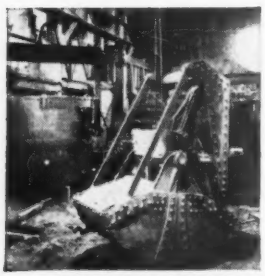
Blaw-Knox Shark Tooth Buckets are available in a wide range of sizes and for different headroom conditions.

FOR EXTREMELY LOW HEADROOM



THIS Single-Line Hook-On Bucket solves rehandling problems when headroom is extremely limited. The ¾ yd. capacity bucket requires only 6'7" operating headroom. Also available in larger sizes.

FOR AVERAGE OR UNUSUAL CONDITIONS



THERE is a type and size of Blaw-Knox Single-Line Hook-On Foundry Buckets to meet a wide range of operating conditions. Blaw-Knox can best give you the competent engineering service that makes possible selection of the bucket suited to your needs.

Write for Bulletin 2232 today

BLAW-KNOX DIVISION
of Blaw-Knox Company
2097 Farmers Bank Bldg., Pittsburgh 22, Pa.
New York • Chicago • Philadelphia • Birmingham
Washington • San Francisco

BLAW-KNOX
FOUNDRY BUCKETS

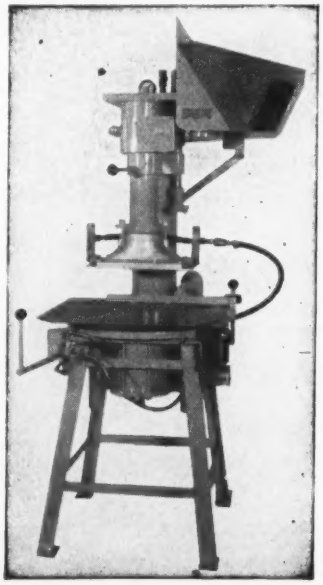
HEAVY DUTY

These Desmond Heavy Duty Dressers provide shearing as well as picking action. Spindle is mounted in dust protected ball bearings. Cutters replaceable without adjusting the bearings. Ask your industrial distributor for the Desmond Dresser Guide wall chart . . . THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO.

DESMOND

THE ONLY COMPLETE LINE OF GRINDING WHEEL DRESSERS AND CUTTERS

COR-BLO AUTOMATIC



HIGH DRAW MODEL "C-H-E"

Cores up to 8 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

Let us figure on your requirements.

HARRISON MACHINE COMPANY
Wesleyville, Erie, Pa.

ALL GRADES OF WASHED, DRIED, SCREENED

SILICA FOUNDRY SANDS

Produced from the celebrated Ottawa District St. Peter Sandstone

Steel Molding Sand • Core Sand • Blast Sand • Furnace Bottom Sand
Opener Sand • Sand for Non-Ferrous, Aluminum, Magnesium Castings
Sands for Croning "shell" process, and for precision castings.
MICROSIL Ground Silica (5 Standard Grades of pure white Silica Flour)

MICROSIL GROUND SILICA

STANDARD SILICA CORPORATION

209 South LaSalle Street, Chicago; plants at Ottawa, Illinois
DISTRIBUTORS IN ALL PRINCIPAL CITIES

BLACKHAWK SILICA SAND

SHORT CUT TO PROFITS

ohio MAGNETS

WELDED AND BOLTED TYPES • ALL SIZES • COMPLETE CONTROL EQUIPMENT • 26 YEARS A LEADER IN MAGNETIC MATERIALS HANDLING.

THE OHIO ELECTRIC MFG. CO. • 5900 MAURICE AVE. • CLEVELAND, O.
Associate Member Institute of Scrap Iron and Steel, Inc.
A-2757

EXPERIENCE . . .

MECHANIZED PRODUCTION

When considering construction of a new foundry—modernization or expansion of existing facilities—call on a Ferguson First Team. They are qualified by years of foundry experience—have helped others to increased production efficiency through mechanization.

Preliminary Discussions in Confidence and Without Obligation.

THE H. K. FERGUSON COMPANY
ENGINEERS AND BUILDERS
Headquarters: Ferguson Building, Cleveland, Ohio
District Offices: New York, Houston, Chicago, Los Angeles, Cincinnati

. . . THE FOURTH DIMENSION

HAUCK OIL AND GAS BURNING EQUIPMENT

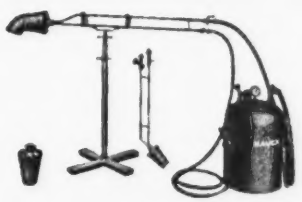
for
CUPOLA LIGHTING
MOLD DRYING
LADLE HEATING
CORE BAKING
FURNACE HEATING

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

Featuring
3 BIG OPERATIONS WITH 1 EQUIPMENT



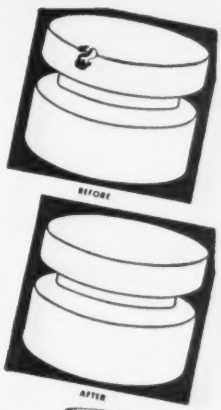
This Hauck All-Purpose Unit with interchangeable Burners and Nozzles, lights cupolas, heats ladles, dries molds. Fast, efficient—easy to handle. Burner flame adjustable and can be directed from any angle. Nothing like it for superior performance. Get Hauck Foundry Catalog.

HAUCK MANUFACTURING CO.
106 Tenth St., Brooklyn 15, N. Y.

Venturi low pressure and high pressure air atomizing oil burners for ladle heating, core and mold ovens, melting and annealing furnaces.

For Surface Blemishes in

ALUMINUM CASTINGS



Have you used the Smooth-On Foundry Cement made especially to correct blow holes, porous and rough spots, dents and other unsightly but harmless surface defects in otherwise sound *aluminum* alloy castings?

Applied like the widely used Smooth-On *Iron* Foundry Cement, Smooth-On No. 8 *Aluminum* Cement fills in evenly, hardens quickly, matches perfectly. Stays in place, too, for it expands slightly as it sets.

Smooth-On No. 8 Aluminum Cement comes in 1- and 5-lb. sizes. 1 lb. will fill 17 cu. in. Order it by NAME AND NUMBER from your supply house. If they haven't it, write us. If you have not yet discovered Smooth-On No. 8, ask us for

FREE SAMPLE TO TEST

You'll receive also the famous 40-page SMOOTH-ON HANDBOOK, filled with industrial uses for the various Smooth-On Cements. 170 illustrations. Write today.

SMOOTH-ON MFG. CO., Dept. 17
570 Communipaw Ave., Jersey City 4, N. J.

Do it with SMOOTH-ON
No. 8 ALUMINUM CEMENT

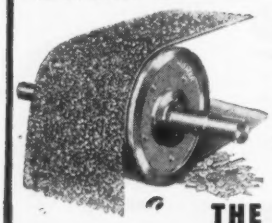
FOR SAND SLINGERS, CONDITIONERS AND CONVEYORS . .

HERE IS THE ANSWER TO YOUR MAGNETIC SEPARATOR JOBS!

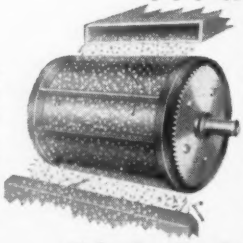
HOMER "Power-Plus" Magnetic Separators

Permanent non-electric—Unaffected by Heat, Cold, Moisture

. . . CAN BE USED INSIDE or OUTSIDE PLANT . . .

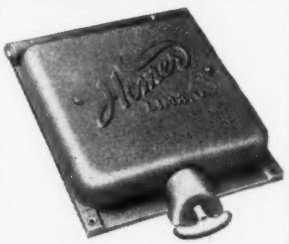


Homer MAGNETIC PULLEYS and UNITS —Available in standard diameters from 12" to 30"; belt widths 4" to 60". Special sizes upon order.



Homer MAGNETIC DRUMS—Available in standard diameters from 12" to 30"; face widths 4" to 60". Can be furnished with or without enclosure.

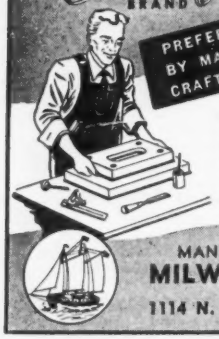
Homer MAGNETIC PLATES—Available in standard widths from 4" to 26"; lengths and number of poles as required. Special fabrications to your specifications.



Write for descriptive bulletins

THE HOMER MANUFACTURING CO., INC., DEPT. 156, LIMA, OHIO

"Craft" BRAND **LEATHER FILLET**



PREFERRED BY MASTER CRAFTSMEN

Write for samples and quotations.

Immediate shipment from stock.

- **PLIABLE** Easy to work with.
- **FINE FEATHER EDGE** Fine bevel edge fits perfectly.
- **CUT TO CORRECT RADIUS** Correct when pressed into place.

MANUFACTURED BY

MILWAUKEE LEATHER BELTING CO.

1114 N. Water St. Milwaukee 2, Wis.

CARLOAD — TRUCKLOAD — PIECE

DOUGHERTY

PERFECTION PATTERN PINE

PATTERN MAHOGANY

Well manufactured and Kiln-dried in our own Kilns for your protection

ALSO—Complete line of CRATING—BOXING—TIMBERS—PLYWOOD MASONITE

DOUGHERTY LUMBER CO.

4300 E. 68th ST. CLEVELAND 5, OHIO

PHONE Diamond 1-1200

THE BEST BUY IS

WATERLOX

TRANSPARENT

Sealer and Impregnator of All Types and All Sizes for CASTINGS

Write the Manufacturer For Details

WATERLOX DIVISION

of

THE EMPIRE VARNISH COMPANY

2636 E. 76th St. CLEVELAND 4, OHIO

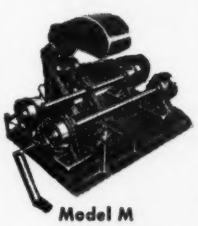
CENTRIFUGAL CASTING MACHINES

Model AS

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

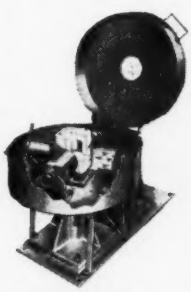
Model J

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.



Model M

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

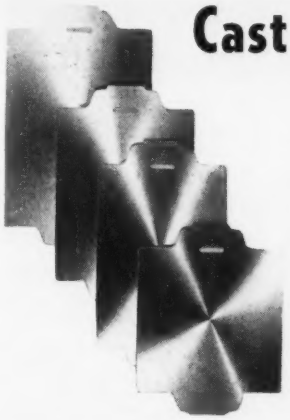


Model J-P

CENTRIFUGAL CASTING MACHINE COMPANY

Nathan Janco, *President*

P. O. Box 947 Tulsa 1, Okla.



Cast Aluminum MACHINED PATTERN PLATES

Shipped promptly from the World's Largest Stock

All standard flask sizes are carried in stock. All plates are cast with one inch flask margin all around PLUS large, well shaped ears for flask pins and vibrator. Order by flask size, not plate size. It will pay you to investigate this source for quality plates.

Some Typical Prices for ⅜" Plates . . . Add 33 1/3% For ½"

10 x 16 . . . 9.90	11 x 18 . . . 11.22	12 x 18 . . . 11.88	14 x 16 . . . 12.18
10 x 18 . . . 10.56	12 x 14 . . . 10.26	13 x 16 . . . 11.58	14 x 18 . . . 14.52
11 x 16 . . . 10.26	12 x 16 . . . 10.86	14 x 14 . . . 11.22	16 x 16 . . . 14.52

Send for Price List Today—Special Shapes and Thicknesses to Order

ARTHUR E. WILL, 643 West 11th Street, **ERIE, PA.**

TUMBLING BARRELS

Roller Bearing throughout
Direct Motor Drive with Speed Reducer
V Belt Motor Drive—Tight & Loose Pulley Drive

ROYERSFORD FOUNDRY & MACHINE CO.
BOX F
ROYERSFORD, PA.

A. A. WICKLAND & CO.

FOUNDRY CONSULTANTS

ENGINEERING BUILDING · CHICAGO 6, ILLINOIS

HARDLAC

Protects
WOOD or METAL
PATTERNS

• *In Use Or In Storage*

Hardlac pattern coating in standard pattern colors recommended by A.F.A. is ready to use and easy to apply. It sets up a smooth surface that resists core-oil absorption and sand abrasion. Protects patterns from swelling, shrinking and cracking. Ideal for metal patterns, also. *Write for Literature.*

McDOUGALL-BUTLER CO., INC.
General Offices, Buffalo 14, New York

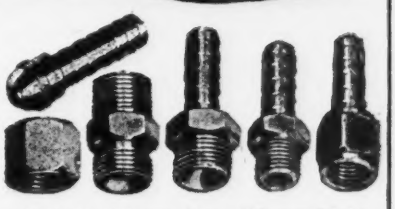
Air-O-chek The Valve with the internal fulcrum lever

An invention in valve means

Ingenious lever arrangement makes conventional packing stem and gland unnessary.

Used in leading foundries and machine shops.

See your jobber or write direct for full details



AIR-WAY PUMP & EQUIP. CO., 1058 N. Kilbourn Ave., Chicago 51 Ill.

HAYNES EQUIPMENT
JOLT SQUEEZER

This portable jolt squeezer is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder. Jolt tables 17" x 20" and 19" x 22".

The post and squeeze cylinder are cast in one piece. Top of post machined to take 2-7/16" cold rolled shaft for the swing arm. Zerk fittings throughout.

No bolts or screws in this machine!

Equipped with air gauge, pop-off gauge and pin for gate horn.

The price will interest you!

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST., KALAMAZOO, MICH.

LADLES—BRASS FURNACES—CORE OVENS

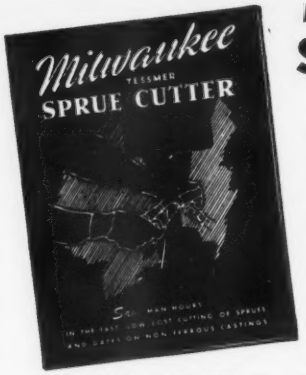
PURO-SEAL FLUX

for producing BETTER BRASS *and* ALUMINUM CASTINGS

Write for Particulars and TRIAL SAMPLE

PURO SEAL — BALANCED FLUX — FOR THE PURIFICATION OF METALS

THE PURO-SEAL COMPANY
3323 WEST 3rd STREET · CLEVELAND 13, OHIO



MILWAUKEE-TESSMER
Sprue Cutter
for
Non-Ferrous Foundries

- Cuts Sprues and Gates with One, Swift, Sure Stroke.
- Does away with tedious hand labor.
- Speeds flow of work through cleaning department.
- Built for years of Rugged, Low-Cost Service.
- 2 Sizes, ¾" and 1¼" square. Built-in electric motor or belt drive.

Write for Illustrated Bulletin

RICE PUMP & MACHINE CO.
222 North Milwaukee St. Grafton, Wisconsin

EMPIRE THAT GOOD By-Product Coke:

FOR FOUNDRY • METALLURGICAL • CHEMICAL • WATER GAS • DOMESTIC USES

PHONE 3-9135

DEBARDELEBEN COAL CORPORATION
Transportation Building
BIRMINGHAM 3, ALA.

DeBardeleben Preparation and Service Give Added Value

FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

ENGINEERS

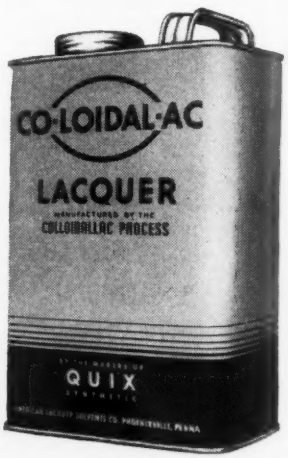
Patterns COME CLEAN

from the sand when they are coated with hard, heat-and-abrasion resistant CO-LOIDAL-AC Lacquer. You will like the improved mold quality obtained and the extra long life of this superior finish.

Direct factory-to-you sales makes possible exceptional value. Available in gallons or drums, clear or colors. Place a trial order today.

WRITE FOR COMPLETE INFORMATION

AMERICAN LACQUER SOLVENTS CO.
Perkiomen Junction, Phoenixville, Pa.



CHEMISTS and METALLURGISTS

Grey Iron Foundry Consultants
Complete Foundry Testing
Established over 25 years

A. H. PUTNAM COMPANY
Rock Island, Illinois

EF

GAS, OIL AND ELECTRIC
FURNACES

For all annealing and heat treating requirements

THE ELECTRIC FURNACE CO. • SALEM, OHIO

WILLIAMS "HOOK-ON" SINGLE LINE BUCKET

The Williams "Hook-on" Single Line Bucket is designed especially for foundry service in ⅜ to 2 cubic yard capacities. Its many features of design and construction are described in an illustrated bulletin sent free on request. Write

SPECIAL TYPE *for* FOUNDRY SERVICE

THE WELLMAN ENGINEERING CO. • CLEVELAND, OHIO

PRODUCERS CORE SAND CORPORATION

PITS AT
MICHIGAN CITY, INDIANA
AND SAWYER, MICHIGAN

MICHIGAN CITY, INDIANA

COST CONTROL
WESTOVER ENGINEERS

Westover ENGINEERS

FOUNDRY MANAGEMENT CONSULTANTS
3110 WEST FOND DU LAC AVE., MILWAUKEE 10, WIS.

There is no better time than NOW to review incentives, methods, scheduling, production control and paperwork processes.

CLASSIFIED ADVERTISING

Help Wanted

GENERAL SUPERINTENDENT

We need a man capable of handling a modern mechanized foundry with several hundred employees. Knowledge of aluminum not essential—we have the necessary technicians. We want foundry managerial experience. This is a permanent lucrative position. Kindly state age, education and experience.

ALUMINUM ALLOYS CORP.

6650 W. WALTON DETROIT 10, MICH.

TYLER 8-5300

FOUNDRY SUPERINTENDENT

For shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability, and good practical and technical background. Excellent opportunity with long established company of best reputation.
Reply in confidence giving full information as to age, background and experience as well as salary requirements. Address: Box 470, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Wanted by old established plant in Tennessee operating ferrous and nonferrous foundries graduate metallurgist with foundry experience to take charge of quality control. Must have good personality, able to handle and work with labor. Salary commensurate with education and experience. Excellent opportunity for advancement. Address: Box 510, FOUNDRY, Cleveland 13, Ohio.

MALLEABLE FOUNDRYMAN

With practical knowledge of repetition molding, pouring, coremaking. Excellent opportunity in small and new organization near Mexican border. Competent laboratory assistance provided. Address: Box 528, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Practically trained and experienced man, 35 to 50, for our gray iron foundry producing machinery castings, light and medium weights, for ourselves and others. Plant operating continuously for sixty years in good Ohio city. Fine permanent opening for right man. Supply detailed history, references and requirements. Address: Box 549, FOUNDRY Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Aluminum experimental and development foundry. Experience in permanent molds and dry sand desirable. Long Island location. Ideal living conditions. Write or wire for interview stating age, education, experience, qualifications.

AL-FIN DIVISION
FAIRCHILD ENGINE AND AIRPLANE CORPORATION
FARMINGDALE, L. I., NEW YORK

FOUNDRY FOREMAN

Must have wide knowledge of brass foundry, producing from sand molds. Production castings, cored and solid work. Give full particulars in first letter and salary desired.

BOX 550

FOUNDRY CLEVELAND 13, OHIO

DIE CAST DIE DESIGNER OR PERMANENT MOLD DESIGNER

Light metals experience required. This is a permanent job with unlimited future for qualified man. Position is in modern midwest foundry facility now undergoing expansion. Salary commensurate with ability. Bonus plan. Send complet resume. Address: Box 499, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY SUPERINTENDENT

Foundry Superintendent for jobbing gray iron foundry in Kentucky. Supervise the operation of squeezer, roll-over and floor molding for castings from one pound to 20 tons. Must have knowledge of cupola and ability to mix iron by analysis.

BOX 533

FOUNDRY CLEVELAND 13, OHIO

ENGINEERING GRADUATE

Mechanical Engineering Graduate of the past several years for a nonferrous jobbing foundry in middle eastern section of the country, to train for position as superintendent and to operate physical, chemical and sand control laboratories. Preliminary training period of two years can be provided for those without foundry experience. Give full details of experience and salary desired in first letter. Also enclose photo.

BOX 537

FOUNDRY CLEVELAND 13, OHIO

EXPERIENCED FOUNDRYMAN

Midwestern gray iron foundry desires experienced man capable of supervising production and assembly of small to medium sized cores. Must be able to teach and coordinate making of cores on benches and coreblowers. In replying please state age, experience and salary expected. Address: Box 302, FOUNDRY, Cleveland 13, Ohio.

FOREMEN WANTED

Three different positions to be filled: CORE ROOM FOREMAN — FOUNDRY FOREMAN — MASTER MECHANIC in mechanized grey iron job casting foundry. Experience essential. State age, qualifications and salary requirements. Address: Box 558, FOUNDRY, Cleveland 13, Ohio.

TECHNICAL SALESMAN

For an ESTABLISHED PRODUCT. Experience required in the FOUNDRY or STEEL Industries.
EXCELLENT OPPORTUNITY
Salary plus profit sharing basis.
BOX 530
FOUNDRY CLEVELAND 13, OHIO

ASSISTANT PLANT SUPERINTENDENT

The man we are looking for must have practical background on nonferrous castings of every description—namely art bronze markers and memorials, jobbing castings, cast in aluminum bronze, manganese bronze, phosphor bronze and aluminum alloy aircraft castings. He must be able to assist in directing entire personnel not only in the foundry but in the pattern shop, grinding, finishing, coloring and shipping departments as well. Address: Box 531, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

For a jobbing gray iron foundry in central Pennsylvania melting 4 to 6 tons per day. Must have experience in cupola operation, molding and core room practice. List personal experience, availability and salary expected. Address: Box 554, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY SUPERINTENDENT

Thorough experience in nonferrous foundry required. Must have technical knowledge and experience in all phases of foundry work in a shop using automatic molding and core blowing practices and producing pressure type work with synthetic sand. Please give personal experience, history, availability and salary expected in first letter. Address: Box 517, FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY SUPERINTENDENT

Steel Foundry Superintendent wanted for well established Southern jobbing foundry producing carbon and alloy steels. Only applicants who are looking for a permanent job need apply. Give details of experience and salary wanted in first letter. Write Box #534, FOUNDRY, Cleveland 13, Ohio.

SALES ENGINEER

Nonferrous experience or degree in Mechanical or Metallurgical Engineering. Age 25-35 approx. Give complete working experience and enclose photo in first letter. Some travelling necessary. Reply Box #535, FOUNDRY, Cleveland 13, Ohio.

JOLT-STRIP FOREMAN

Foreman to set up and supervise mechanized rollover and jolt squeeze strip production line. Must be experienced on this type unit producing high production. This is a new production line in the East. State age and experience. Address: Box 500, FOUNDRY, Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT

Gray iron foundry wants competent man with experience in production of high grade castings, jobbing, squeezer and rollover work. Address: Box 529, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Gray iron foundry melting 25 tons daily. Medium to heavy castings, jobbing, semi-production. Located in Chicago requires superintendent capable assuming full responsibility all foundry operations. Small apartment available. Address: Box 561, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY SUPERVISOR

Gray iron foundry near Philadelphia. Production 50 tons. Experienced in jobbing castings, setting up molding rates, costs, etc. Well experienced in cupola practice and molding sands. Address: Box 543, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Modern high production gray iron foundryman, practical, technically trained in the most modern mechanized foundry equipment. Well versed in all phases. Production, quality, slingers, jolts, coreblowers, hot blast cupolas, modern cleaning equipment, high tonnage, etc. Seeking new connection with large firm. Background of experience and ability is outstanding in foundry world. Only firm needing services of such a foundryman please answer. State all facts in first letter. Salary requirements high. Address: Box 547, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Practical gray iron foundryman, molder by trade, technically trained graduate metallurgist. Broad background of experience in general jobbing and high production of quality castings. Well versed in all phases of the foundry. Dry and green sand, pit molding, cores, cupola and metal control. Wants connection with progressive foundry needing real foundryman that can produce required results. Address: Box 546, FOUNDRY, Cleveland 13, Ohio.

WORKS MANAGER
OR
FOUNDRY SUPERINTENDENT

Age 46, practical and technically trained. Commercial jobbing and production work. Twenty-eight years' experience of which twenty-five were in executive capacity. Well versed in all phases of jobbing and production work in brass, bronze, aluminum and iron castings. Progressive and up to date in modern methods. Capable of taking complete charge of foundry or foundries. Salary expected $10,000 per year plus bonus. Available on short notice. Address: Box 548, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

PLANT MANAGER OR SUPERINTENDENT

For gray iron and semi steel. Molding experience eighteen years, foreman two years, superintendent eleven years, manager nine years small foundry. Specialized in price work, figure jobs from blue prints to supervising cupola or electric furnace. Have run large and small shops, jobbing and production work. Employed now. Would like to change. Age 58, good references, good health. Address: Box 493, FOUNDRY, Cleveland 13, Ohio.

MANAGER—ASSISTANT TO PRESIDENT

Steel, iron, brass. Thoroughly experienced in every shop operation, metallurgy, engineering, accounting and management. Excellent ability to develop a superior organization by leading, teaching and example. Outstanding reputation for keen analysis, sound judgment and a rare combination of practical experience, managerial ability and effective personality. Address: Box 375, FOUNDRY, Cleveland 13, Ohio.

ASSISTANT OR SUPERINTENDENT

Thirty years practical experience in all phases of foundry operation. Specialize in gray iron production, squeezer, rollover and pinlift molding. Casting automotive, agriculture, marine, diesel and jobbing work of all metals. Can supervise and perform any operation in a foundry. Reply Box #538 FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVE

Practical foundryman with academic training, 26 years' operative experience in ferrous foundries seeks affiliation with foundry supply firm as technical or sales representative. Address: Box 491, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT AND METALLURGIST

Experienced in production of quality castings, all phases of grey iron foundry operations. Know cupola operations, alloying and metallurgy, loam, green and dry sand practice. Castings weighing ½ to 25,000 lbs. Production 1,700,000 lbs. of good castings per month. Casting loss very low 0.65 to 0.75 or less per month. Come and see for yourself. Also experience in brass, bronze and aluminum castings. Married, age 45. Address: Box 512, FOUNDRY, Cleveland 13, Ohio.

SALES POSITION

Young man, 26, currently selling to foundry trade. College graduate, single, free to travel and relocate desires sales position in foundry or allied industry. Address: Box 501, FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

Twenty-seven years' operative experience in grey iron, malleable iron and brass foundries, production and jobbing work, cupola electric furnace and duplex melting, progressive sand control for molding and core making, heat treating and gating, cost conscious seeks employment with progressive foundry. Address: Box 492, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

Can take full charge of small or medium sized iron foundry. Practical molder, technical training. West of Rockies preferred. Address: Box 551, FOUNDRY, Cleveland 13, Ohio.

PRACTICAL-TECHNICAL

Modern grey iron foundryman, age 49. Molder by trade, graduate metallurgist. Outstanding background of experience and ability in highly mechanized high production foundry, using most modern methods and equipment. Machine tool, high pressure castings, diesels, automotive. Sound in sand control, molding, cores, cleaning, working from blueprints and minimum costs. Wants to connect with sound reliable firm needing services of a high type foundryman to get results. Address: Box 544, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Desires position as superintendent or foreman gray iron or nonferrous. Practical man 26 years' experience jobbing or production. Western or central New York preferred but not essential. Address: Box 559, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT PRACTICAL—TECHNICAL

Progressive modern foundryman with a background of 28 years experience producing quality castings. General jobbing, production in modern foundries. Well versed in all phases and costs. Making change and would like to contact old sound firm needing outstanding foundryman for results. Foundry employing not over 250 desired. Address: Box 545, Foundry, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Twenty-eight years of foundry experience in grey iron production and jobbing work. Ten years of practical and technical training with eighteen years in executive capacity. Experience in semi or mechanized shops. Age 46, best of references. Address: Box 357, FOUNDRY, Cleveland 13, Ohio.

Foundry Consultant

FOUNDRY CONSULTANT

Available for short periods. We specialize in scrap castings—how to eliminate or why we have scrap. Have 35 years' experience as molder, core maker and executive. Address: Box 521, FOUNDRY, Cleveland 13, Ohio.

Opportunity

OPPORTUNITY

Foundry manager or superintendent buy into well established brass and iron jobbing foundry. Expansion of business requires more capital and supervision. Excellent opportunity. Address: Box 527, FOUNDRY, Cleveland 13, Ohio.

YOUR FOUNDRY PROBLEM

Can be solved, your plant or mine. Foundry operator trouble-shooter in sand castings and permanent molds, ferrous and nonferrous. Submit any foundry problems.

WAGNER PERMANENT MOLD CO.
2910 EMPIRE AVENUE
BURBANK, CALIFORNIA

Capacity Wanted

OPEN CAPACITY

Wanted for new type cast iron soil pipe and fittings. Have equipment necessary to start small production. If interested, write giving cupola capacity of foundry, etc. to: BATCHLER MFG. CO., 204 MIDLAND SAVINGS BLDG., DENVER 2, COLO.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

OPEN CAPACITY

Brass or bronze centrifugally cast bushings. Can meet all specifications including x-ray. Address: FOUNDRY DIVISION, CENTRIFUGAL CASTING MACHINE CO., P. O. BOX 947, TULSA, OKLAHOMA.

Foundries For Sale

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

FOR SALE

Nonferrous foundry, semi-production in small northwestern Ohio town. Four gas furnaces—three new SPO's. Porbeck automatic core oven complete woodworking and repair shop. 35 miles from large industrial town. All machinery and equipment less than five years old. Address: Box 555, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Foundries For Sale

FOUNDRY FOR SALE

Small, well established gray iron jobbing foundry. Located in leading industrial Rocky Mountain area. $45,000 required.

BOX 539

FOUNDRY **CLEVELAND 13, OHIO**

FOR SALE

Modern gray iron foundry and pattern shop, 4 years old, capacity of 20 tons per day. Two buildings. Both fully equipped. Located in Virginia. Address: Box 462, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Nonferrous foundry in large Wisconsin industrial town. Get in at the start. We have a large volume of defense orders. Owners must retire. Price $50,000. Address: Box 504, FOUNDRY, Cleveland 13, Ohio.

PRODUCTION FOUNDRY FOR SALE

22,000 sq. ft. buildings. Capacity 20 air squeezer floors, 15 running. Completely equipped including a 54" Whiting cupola with skip hoist and a 40 x 48 American Wheelabrator. Price $125,000. Address: Box 556, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Most profitable medium size jobbing foundry in this section of the country. Well equipped, situated between Cleveland and Detroit. Arranged for production. Deal involves $250,000.00. Owners must retire. Opportunity for user of castings with certificate of necessity. Address: Box 340, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY

Steel and cement block buildings. Ten ton capacity. Fully equipped for production of light castings. Going business in Michigan-Ohio area.

BOX 560

FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRIES FOR SALE

IRON FOUNDRY. Steady business. Well established. Bargain at $40,000.

IRON FOUNDRY. Produces castings up to 2½ tons. Good buildings and equipment. Experienced organization.

EDWARD H. ZOLL

790 BROAD ST., **NEWARK 2, N. J.**

GRAY-IRON FOUNDRY

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story heights 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

1—Air jarring molding machine 20" cylinder-table 66" x 84", 14,000 lbs. capacity (Similar to International Molding Machine Co.'s type J.) State make, age, conditions and price.

PAXTON-MITCHELL CO.
2614 MARTHA ST. OMAHA, NEBRASKA

WANTED TO BUY

TABOR SQUEEZE STRIPPING MOLDING MACHINE. STATE AGE, CONDITION AND PRICE

NATIONAL FOUNDRY CO. OF NEW YORK INC.
10 SANDFORD STREET
BROOKLYN 5, NEW YORK

WANTED

BRIDGE CRANES

ARNOLD HUGHES COMPANY
765 PENOBSCOT BLDG. DETROIT 26, MICH.
WOODWARD 1-1894

WANTED

Millett type portable core oven with four 7" and one 11" semi circular or quarter round shelves equipped with natural gas burners. Address: SMITH & RICHARDSON MFG. CO., GENEVA, ILL.

WANTED

One gas fired core oven with controls, either drawer type or push in type. Desirable inside dimensions 5 to 6 feet wide, 6 feet high, 6 to 7 feet deep. State make, condition and price in first reply. Address: Box 448, FOUNDRY, Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

WANTED

Sand Blast & Foundry Equipment & Parts.
Address: DIAMOND SALES, INC.
5654 WEST JEFF., DETROIT 9, MICH.

EQUIPMENT WANTED

2—Osborn or equal jolt strippers with 10" draw.
2—Johnston & Jennings #612 Pacemakers or equal.
1—36 x 42 American Wheelabrator Tumblast machine.

FALL RIVER FOUNDRY CO. INC.
1148 DAVOL STREET FALL RIVER, MASS.

WANTED

Apron conveyor, 18", 20" or 24" wide. Address: NATIONAL FOUNDRY CO. of NEW YORK INC., 10 SANDFORD STREET, BROOKLYN, NEW YORK.

WANTED

Used electric arc melting furnace lectromelt W or X or somewhat larger Kuhlman or other. Address: Box 532, FOUNDRY, 60 E. 42nd St., New York 17, N. Y.

WANTED

Pottstown tappers for pipe fittings, capacity 1" and 2" for foreign use. Address: Box 557, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

1—Stroman twin burner, oil fired melting furnace, 600# capacity. Price $850.00.

BUCK IRON CO.
ROUTE #1 QUARRYVILLE, PA.

For Sale

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
220	24 oz.	Spencer	25	220/440	
450	40 oz.	Spencer	7½	220	1750
225	10 oz.	Spencer	1	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

1500	1" SP	Sturtevant			625
9100	7" SP	Sturtevant			1900
4500	16 oz.	G. E.	30	440	3600
8150/62500		Bishop & Babcock		(40½x50 outlet)	
2500	7 oz.	Sturtevant	15	220/440	1800
2300	1" SP	Clarege	3	220/440	1800
950	16 oz.	Nth. Amer.	7½	220/440	3600
800	8 oz.	Nth. Amer.	3	220	3600
660	20 oz.	AllenBillmyre	7½	440	3600
450	6 lb.	A&B	30	220/440	3450
400	4.3 oz.	Spencer	2	220/3/60	3500
340	20 oz.	AllenBillmyre	3	440	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

#1 Simpson bucket loader, 500 lb. sand capacity with legs extended 12 ft, suitable for refuse handling or loading core blower hopper. Address: VICTORIA METAL CO. INC., 2001 HAYBARGER AVE., ERIE, PA.

NEVER USED AIR TOOLS

Chicago Pneumatic, Ingersoll-Rand, Thor, Cleco —far below list prices. Send for inventory and price list. ADDRESS: HAYNES EQUIPMENT CO., INC., 144 FULTON ST., NEW MILFORD, N. J. PHONE ORADELL 8-2683.

FOR SALE

Williams clamshell bucket—¼ cu. yard. Closed head type hook on single line, size 879C. Like new. Price: $850.00. Address: R. A. PARKINSON & SON, 519 N. DELAWARE AVE., PHILADELPHIA 23, PA.

FOR SALE

TUMBLAST CABINET, Pangborn, model 1172A, ser. #7412911, Gravity Feed or Air Blast, 30" x 40" Barrel model 2 GD1, 2.7 rpm. Uses sand or shot. Good cond. All motors A.C. $1250.00 fob.
TABOR — PORTABLE SHOCKLESS JARRING ROLL OVER & PATTERN DRAWING MACHINE—24" x 16". $350.00 fob.
OSBORN—75 J JOLT SQUEEZERS (6). 15 x 18 size and 16 x 20 size. $135.00 ea., fob.
SULLIVAN—AIR COMPRESSOR 11 x 10, 40 hp AC motor & starter.
SULLIVAN—AIR COMPRESSOR 6 x 6, 10 hp motor & starter & after-cooler.
MAGNETIC SEPARATOR, Ding's mfg. 12" x 18"—110 V. S.Ph. motor, 2 hp. Ser. R 5771. $600.00 fob.
SAND BLASTING TANK, Pangborn, model 1AV11. $150.00 fob.
SPHERICAL FURNACES, Romph mfg., cap. up to 3000#.
SAND CUTTER, Am. model M.
SAND SLINGER, Royer mfg., model NDP 41. $375.00 fob.
Sly—TUMBLING BARRELS
DEGREASING UNITS—all sizes.
AIR TOOLS
FANS & BLOWERS—up to 125,000 CFM.
ELECTRIC FEED RAILS & TROLLEYS
CONVEYOR—all sizes and types.
HOISTS—electric, hand, air—1 to 10 ton.
CRANES—overhead & jib—all sizes.
MOTORS, SPEED REDUCERS, BLOWERS — any size.
Industrial VACUUM CLEANING units.
GRINDING WHEELS—all sizes.
AIR COMPRESSORS—from 1 hp up.
TINNED CHAPLETS, approx. 22,000. ¼" Stem x ⅛" high x 1" square ends. 2 cents ea.
FOUNDRY EQUIPMENT. Send us your inquiries.

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE CINCINNATI 32

FOR SALE

DC Westinghouse motor — 10 HP — 230 Volt RPM 830: $125.00
2 DC motors — 18 HP — 230 Volt — 900 RPM: $150.00 each
1 DC motor—75 HP—230 Volt—800 RPM—$350.00
5—1 ton Ingersoll-Rand Air Hoists: $75.00 each
3—2 ton Ingersoll-Rand Air Hoists: $125.00 each
3—3 ton Ingersoll-Rand Air Hoists: $150.00 each
65 feet of 3 inch Wrought Iron Pipe: 50c per foot
Fuse and Switch Boxes—15 or 30 amp: $15.00 each

THE DANVILLE FOUNDRY CORP.
P.O. BOX 119 DANVILLE, PA.

For Sale

FOR SALE

3—"G" Rollover Machines 20 x 8.
1—SPO Jolt Strip Squeeze Molding Machine.
2—Osborn J-75 Jolt Squeezers 10".
1—Sprue Cutter with 2 HP. Motor.
1—North American Blower with 15 HP. Motor, 2100 C.F.M., 16 oz. pressure.
6—10" New—Haynes Jolt Squeezers.
6—12" New—Haynes Jolt Squeezers.
1—Chicago Pneumatic Air Hoist.
1—Osborn Molding Machine Model 342-4.
1—International Molding Machine HJ 16 x 6.
1—Band Saw, Tilting Table, 32" Wheel.
1—#36 Osborn Core Draw Machine.
1—Lyon-Raymond Hyd. Lift Truck 2500 lb. capacity.
24—Adjustable Flask Clamps.
5—New, 1⅛" Osborn Vibrators.
300 ft. of Good Used ¾" Air Hose in 30 to 75 ft. lengths.
10—New, Squeeze Valves and Handles and 10—New Jolt Knee Valves for Milwaukee Jolt Squeezers.
3—Adams Squeezers.
2—1000 lb. Worm Gear Covered Ladles.
1—24 x 48 Tumbling Barrel.
1—#55 Demmler Core Blower.
1—American Sand Cutter Machine Size 89/70 M.
1—Tabor Plain Bumper, 36" x 36" Table, 6" Piston and is 21½" High from base to top of Table.
1—Johnston & Jennings Jolt Roll-Over Pattern Draw Machine No. 815-RB, 30" x 40" Table.
1—Johnston & Jennings Jolt Squeeze Machine No. 512-P "Jack Rabbit" Portable, Table Size 18" x 22".
1—Micromax Tester, Wall Type, to 2400°, made by Leeds & Northrup Co., Philadelphia.
1—Reliance Motor 3 HP., 3 phase, 60 cycle, 220 or 440—1140 RPM.
1—Robin & Meyers 15 HP. Motor, 3 phase, 60 cycle, 220 or 440—1725 RPM.
2—North American Blowers with 2 HP. Gen. Elec. Motor, 220 or 440, 3 phase, 60 cycle, 3490 RPM., 320 C.F.M.
1—Master Gear Head Motor, Serial #NR-16980—2 HP., 220 or 440, 3 phase, 60 cycle, 1725 RPM., Output on shaft 48 RPM.
1—30" Diameter, 8" Opening, Silica Carbide Cover.
1—General Blower Motor, 3 HP. 16 oz. Pressure, 220 or 440, 3 phase, 60 cycle, 375 C.F.M.
31—12 x 18, Steel Flasks, 4 Cope, 3 Drag.
59 Set—Truscon Steel Flasks, 19 x 20, 8 Cope and 8 Drag.
18 Set—Truscon Steel Flasks, 19 x 21, 10 Cope and 10 Drag.
18 Set—Truscon Steel Flasks, 22 x 23, 10 Cope and 10 Drag.
82 Set—Steel Flasks, 15 x 20, 3 Cope and 8 Drag.
4 Set—Steel Flasks, 22 x 24, 11 Cope and 9 Drag.
32 Set—Steel Flasks, 16½ x 33, 3 Cope and 8 Drag.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA St. KALAMAZOO 53, MICH.

FOR SALE

6—Osborn #275 J Molding Machines, size of tables 20" x 17"
1—Osborn #432 Large rollover, size of table 42" x 12"
1—Osborn small rollover, size of table 14" x 12"
2—Arcade small rollovers, size of tables 14" x 12"
Cast iron flask weights
Assorted crucibles and match plates
1—Tabor molding machine, size of table 16" x 17" Flasks 16" x 8"

METAL FINISHING MFG. CORP.
89 NORTH 11 STREET
BROOKLYN, NEW YORK
EVERGREEN 8-3895

FOR SALE
IMMEDIATE DELIVERY

Ingersoll Rand, Chicago Pneumatic and Thor 1 x 8 portable grinders, Ingersoll and Chicago Pneumatic Chippers #2's & 3's. Write for price list.
No prices in excess of 60% of list.

SEATTLE PNEUMATIC TOOL CO.
535 ELLIOTT W. SEATTLE 99, WASH.

CUPOLA FOR SALE

In good condition, one No. 6 Whiting cupola complete with stack. Price $700.00 FOB Bridgewater, Massachusetts. Address: BRIDGEWATER FOUNDRY CO., INC., OFF HIGH STREET, BRIDGEWATER, MASSACHUSETTS

FOR SALE

Complete pattern equipment for malleable pipe fittings sizes ⅜" to 2", or will cooperate with a foundry to produce. Address: LAKESIDE FOUNDRY, WARSAW, INDIANA.

For Sale

FOR SALE

Used Flask Equipment in lots or single pieces:

No.	Size	Cope	Drag	Type
1	15x18	6"	3"	Aluminum
2	15x17	5"	5"	Wood
32	15x15	4"	10"	Steel
30	8¼x22¾	2½"	6½"	Cast Iron
25	14½x16½	3"	9"	Cast Iron

48 new composition Snap Jackets. Made by Chicago Mfg. & Dist. Co. Crated and ready for shipment.

Also 141 used steel, aluminum and composition jackets in various dimensions.

Send your inquiries for prices and more detailed information on above. Also many other items of foundry equipment available.

KELLY FOUNDRY & MACHINE CO.
ELKINS, W. VA.
PHONE 90

FOR SALE

Tumbling barrel, complete, motors and blower. Used three months. Top opening 23½ x 53⅜. Write R. H. Nolan, Box 990, Rome, New York.

FOR SALE
MISCELLANEOUS EQUIPMENT

2—Osborn Molding Machines, Serial 10680 A & B, like new, Vibrating Squeeze, Double Arm.
1—Spencer Blower, 50 h.p. AC Ball bearing motor with Foxboro Air Weight Control starter.
1—5' x 6' x 1" shell, Sly Tumbler, Motor, starter, patterns for replacement parts.
1—Whiting Coke Igniter, like new.
1—36" Smith wood band saw, belt drive.
1—12" Smith Round Head Jointer, belt drive.
1—26" x 9' Center, C.I. Wood Lathe, belt drive.
1—26" Diam. Cupola, 35' stack, Spencer Blower, new brick for lining.
Also several 10 to 20 h.p. 220-3-60 Electric Motors.

P. O. Box 990, Roanoke, Virginia.
Phone—5556

FOR SALE

Abrasive cutoff machine 10 H.P., 16" x ⅛" x 1" wheels—$350.00. May be seen in operation. Address: STAINLESS FOUNDRY & ENGINEERING CO., MILWAUKEE 9, WISCONSIN.

FOR SALE

One, Pangborn 9' Diam. Multi-spindle Rotoblast Table, type LG-14, complete with dust collector system. Good condition. Immediate shipment. Address: **BLOOMINGDALE RUBBER CO., Chester, Penna.**

FOR SALE

1 American Sand Cutter, Type AA Size 6'-0" NW with 15 HP Motor, Volts 440, 3 Phase.

1—Style 900 GT Hausfeld Gear Tilting Cast Iron Pot for aluminum, blower driven by electric motor for use with natural gas. Brand new, has never been used.

We have the following flask equipment we will sell only as a lot, no single pieces: Hines aluminum heavy-duty pop-off type flasks, truss rods on side pieces, single pins, ¾" round. No jackets.

No.	Size	Cope	Drag	Pin Centers	Condition
1	24x48	12	12	50½	Excellent, slightly used
1	34x47	12	12	51½	New
1	36x36	12	12	40	New
1	42x42	12	12	46	New
2	12x24	6	6		Excellent
1	12x24	9			Excellent
2	12x24		9		Excellent
1	16x16	6			Excellent
1	16x16		5		Excellent
1	16x24		9		Excellent
1	16x28		9		Excellent
1	18x24	6	6		Excellent
2	18x24	9			Excellent
2	20x20	9	9		Excellent
1	20x20	12	12		Excellent

MEMPHIS CASTING WORKS INC.
1006 OAKLAND AVE. MEMPHIS 1, TENN.

FOR SALE

2—Osborn #712 Jolt Squeeze Pin Lift Machines. Perfect Condition.
2—Osborn #601 Jolt Rollover Pattern Draw Machines.
2—Osborn #332-38 Jolt Squeeze Rollover Draw Machines, equal to new.
2—International Portable Jolt Rollover Pattern Draw Machines.
4—International Hand Jolt Hand Rockover Coremaking Machines.
1—Spencer Turbo Compressor 1300 Cu. Ft. per Min. @ 32 oz. pressure direct connected to 25 H.P. Westinghouse Motor.

BOX 542
FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

1—Porbeck 5 Drawer, Oil-Fired Core Oven complete with controls.

Write for further details.

The GOEHRINGER FOUNDRY SUPPLY CO.
919 W. Fifth St. Cincinnati 3, Ohio

FOR SALE

2—Used #6 Whiting cupola melting sections only $500.00 each.
1—GE centrifugal blower 4,000 CFM with 40 HP motor type FS-347 $1,000.00.

DETROIT BRASS & MALLEABLE WORKS
1000 SO. CAMPBELL AVE.
DETROIT 9, MICH.

FOR SALE

1—Fig. 462 Fisher type BB1 oil fired, hand tilting furnace #275 crucible. Used less than six months. Complete in every detail.
1—G/E Centrifugal Blower. Direct connected with 12 h.p. motor. Excellent condition. Includes starter box.
3—Practically new International Type LJS Jolt Squeezers—12" cylinder. Portable design.

SUPERIOR BRASS FOUNDRY
BELOIT, WIS.

FOR SALE

1—10" table jolt squeezer—never uncrated.
1—Herman jolt rollover. 750 lb—20 x 36 table. Four years old. Rarely used.

ARKANSAS FOUNDRY COMPANY
LITTLE ROCK, ARKANSAS

FOR SALE

#3 Simpson mixer 8 ft. diameter with unit drive and skip hoist. Good condition. Price $4000.00 FOB present location. Midwest foundry. Address: Box 490, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

#400-125 Crucible tilting Stroman Furnace. Blower attached, oil fired. Address:
M. T. ST PETER,
WATERFORD, CONNECTICUT.

FOR SALE
FOUNDRY EQUIPMENT & MACHINERY

5—J & J Squeeze Moulding Machines, Used
1—Rotoclone Dust Collector, New Complete.
2—Round Tumbling Mill Cleaners, Used, M.D.
2—Square Tumbling Mill Cleaners, Used, M.D.
216—Adams Cast Iron Flask Jackets, New, 3" C & D
40—Adams Cherry Flasks, Various Sizes, New.
1—3 HP Model 100 Std. Cadet Grinder, 2-12" x 2" W.
1—3 HP Model 10E Queen City Grinder, 2-12" x 2" W.
1—#6 Gardner DE Disc surface Grinder, 10 Hp. Used.
1—5 HP DeWalt Radial Arm Saw. 16", Used.
3—15" Delta Drills, ½" Bench Type, M. D. Used.
and many other items.

CALL————Phone 2-3492, Or Wire, Or Write.

ROY C. CRAVEN SR. 233 EVENINGSIDE DR., CHATTANOOGA 4, TENNESSEE.

FOR SALE
SAND BLAST EQUIPMENT

Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blades. Price 30% of list.
Pangborn 7GK Rocker-bbl. Loader-dust collector, reclaimer. Complete—$5000.
Pangborn Tumble Blast Barrels, Models 1GF Cap. 1 Cu. Ft; 2-GF 2½ Cu. Ft. Cap. Air type. Like new! Priced 50% of list.
Wheelabrator 6' air table $1500.00.
Wheelabrator 15 x 20 tumblast—$1850
Wheelabrator 36 x 42 tumblast—$5000
Sand Blast Cabinets, pressure-tanks, dust collectors and blowers. All kinds and sizes. Like new. 50% less list price.
Crane—2-ton, twin hook—21' span—$400.00
Fork lift truck—1-ton $900.00.

DIAMOND SALES INC.
5654 W. JEFF. AVE.
DETROIT 9, MICHIGAN

FOR SALE

2—Osborn Jolt, Squeeze, Rollover, Draw Molding Machine

1—Schneible Multi-Wash Dust Collector for 6500 CFM.

GUNITE FOUNDRIES CORPORATION
ROCKFORD, ILLINOIS

CLASSIFIED ADVERTISING

FOR SALE

MOLDING MACHINES
1—International Type R Portable 24 x 10
1—International Type F Stationary 26 x 8
2—Tabor Stationary Jolt Squeeze
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers
BLOWERS FOR CUPOLAS AND FURNACES
2—15 HP Spencer Turbine 2250 CFM @ 16-oz.
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP
METAL MELTING EQUIPMENT
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired
New 32" to 41" dia. shell cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel complete with Pangborn style FM automatic loader. Load capacity approx. 16 cu. ft.
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven. Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room
MISCELLANEOUS
1—#1 Blystone sand mixer, motor drive
1—#1-4 ft. Simpson mixer, motor drive
1—American Sand Cutter 72"
2—#16 Roto-clone units complete
1—Continuous Heat Treat Furnace 57' long, 1200° F. max.
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60
4—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

2—24" x 30' Belt Conveyors 5 H.P. motor 220/440V.
1—Plain Air Jolt Machine Johnston & Jennings 42" x 50" table 10" Cyl.
2—405-77 Osborn Rollover Molding Machines. —A-1 cond.
3—International Hand Rockover Molding Machines.
1—#94 Osborn Core Blower—new.
4—SB-12 International Core Blowers.
1—Pangborn 28 cu. ft. Rotoblast Type CK with Power Loader.
1—Pangborn 12 ft. dia. Tableblast No. 30 complete with Dust Collector.
1—Dust Collector Parsons #118 complete with 20 H.P. motor & blower.
1—Spencer Turbo Blower 3600 CFM 20oz. 3ph. 60cy. with 30 H.P. 220/440V. 1750 RPM motor—new.
4—Tumbling Mills 30" x 60" with 15 H.P. motor.
1—Double stand grinder with 3 H.P. motor.
2—Double stand grinder with 10 H.P. motors.
1—30 H.P. Air Compressor Pennsylvania water cooled.
4—12,000 gal. vertical tanks.
1—138,000 gal. vertical tanks.

Steel Flask Equipment:

98—19" x 26" 3" x 6" drag 4" cope
180—19" x 16" 3½" x 6" drag 4½" cope
28—17" x 27½" 4" x 6" drag 4" cope
63—22" x 28" 4" x 6" drag 4" cope
30—14" x 30" 3" drag 4" cope—Sterling—New
12—16" x 27" 4" drag 4" cope
30—24½" x 25½" 5" drag 12" cope
30—24" Rd. 5" drag 9" cope
30—24" Rd. 5" drag 12" cope
All copes are barred

EUCLID FOUNDRY & MACHINE EQUIP. CO.
15019 SARANAC RD. CLEVELAND 10, OHIO
TELEPHONE—GLENVILLE 1-1222

FOR SALE

Fisher Melting Furnace with crucible 18" diam. gas fired, hood and doors, capacity 2100 lbs. Aluminum to 9000 lbs Type metal. 200 CFM blower, 220/440 V. 60 C. Wheelco Pyrometer. Like new. Used 30 days.

SMALL MOTORS INC.
2076 Elston Ave. Chicago 14, Illinois

NEW CUPOLA

#4 Whiting standard cupola available for immediate delivery. This cupola was never installed and is in same condition as when we purchased it in 1949. Full details on request for interested groups. If you require a new cupola at once write: Box 552, FOUNDRY, Cleveland 13, Ohio.

For Sale

HEAVY DUTY MOLDING MACHINES

1—Osborn #405-77 Jolt Rollover Pattern Draw Machine complete with oil leveling runout car. Excellent condition.
1—Davenport Jolt Rollover Pattern Draw Machine #48-SA. 50" x 72" table, 24" draw.
1—Osborn #242 Jolt Rollover Pattern Draw Machine.
2—Osborn #403 Jolt Rollover Pattern Draw Machines.
1—International Type F Jolt Rollover Pattern Draw Machine. Table 26" x 34" open end with 16" draw.
All above equipment in excellent condition. Immediate Delivery.

BOX 541
FOUNDRY CLEVELAND 13, OHIO

FOR SALE

(2) Lippman Centrifugal Casting Machines 13½" diameter x 36" long.
Spencer Turbo Blowers
(1) 450 CFM, 24 oz. 5 HP 3450 RPM 3/60/220/440
(1) 400 CFM, 16 oz. 3 HP 3450 RPM 3/60/220/440
(1) 335 CFM, 20 oz. 3 HP 3450 RPM 3/60/220/440
(5) 625 CFM, 16 oz. arranged for DMD
(1) Head-Hi Aerospot Man Cooler, 36", 1½ HP 1725 RPM 3/60/220/440, Model EH-5.
(1) Oliver Pattern Makers Lathe 90" swing x 78" centers. T-slotted floor plate, hand feed compound rest.

SURPLUS & SALVAGE CO., INC.
JAMESTOWN, N. Y. PHONE 7123

FOR SALE

Cupola built 1948 never lined or used. Size 3½ diameter 51 inches lines to 36 inches. Stack height 51 feet above floor. Skip hoist for loading complete with track, cables and reduction gear (no motor). Charging bucket 24" x 52" x 28" deep. Charging port 18 feet above bottom. Could also supply Spencer multi-stage turbo blower 2300 C.F.M. 20 ounce pressure with 20 H.P. motor, 3 ph., 60 cycle 220 A.C. and blast gate. Both can be inspected in building. Priced low for quick sale. Address: Box 553, FOUNDRY, Cleveland 13, Ohio.

SAND CONDITIONING EQUIPMENT FOR SALE

1—Late Model American Sand Cutter, gasoline driven, like new.
1—Jeffries Sanditioner equal to new.

BOX 540
FOUNDRY CLEVELAND 13, OHIO

FOR SALE

2—American Clay 9' Mullers—good working order.
2—Sly tumbling barrels 48" x 76" 1" plates.
4—2047 Osborn jolt rollovers.
2—Reservoir ladles 2000# cap.
7—275 J Osborn jolt squeezers.
Write for our four page list of equipment.
UNIVERSAL MACHINERY & EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PA.

FOR SALE

Cupola charger complete—including weigh hopper, transfer car and 60" cone bottom bucket. Also #8 Whiting cupola, 9000 C.F.M. Roots positive blower.

AUBURN FOUNDRY, INC.
AUBURN, INDIANA

FOR SALE

Osborn #405 power jolt rollover molding machine, equipped with new rollover table, carriage, tracks, 20" x 60" table, 12" cylinder, 18" draw, 16' track, 4 wheel receiving truck, serial #4493.

JOHNSON MACHINERY COMPANY
59 EDISON PLACE NEWARK #2, N. J.
MITCHELL—3-7608

FOR SALE

1—Used 60" x 144"—jolt rollover—draw; Herman Moulding Machine. For further information contact:

MR. A. BOLIN—GR 3556
CROWN IRON WORKS COMPANY
1229 N.E. TYLER STREET
MINNEAPOLIS 13, MINN.

For Sale

MOLDING MACHINES

4—International 20" x 8", Type G
1—Osborn Jolt R.O. #342
1 pr. Tabor Shockless Cope & Drag Machines—Rollover Draw Machine, 36 x 50" Table, 1600 lbs. capacity
Jar Flask Lift, 32 x 48" Table, 2600 lbs. Capacity, Pins Adjustable

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

1—#8 Whiting Cupola, less stack. Used 150 hrs. New in 1949. Complete accessories. Price $3500.
2—Allis-Chalmers Blowers, 75 h.p., 3550 RPM, 12000 F.P.M. at 1 lb. With starting switches. Used 150 hrs. Price $1500 each.

JACK RODEGHIER
712 N. RAYNOR AVE., JOLIET, ILL.
Phone PH. 2-5373

Employment Service

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

SALARIED POSITIONS

$3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.

FOR SALE

CORE MAKING EQUIPMENT

2—Core spinning machines manually operated for spinning green sand pipe cores for 5' lengths soil pipe.
2—Core sand feeding hoppers for core machines complete with shaker drives, motors, starters and supports from floor.
1—5" x 3" Bucket elevator 20' sprocket centers with supports, receiving and discharge chutes. Complete with chain drive from belt conveyor.
1—12" wide sand delivery conveyor 17' 0" centers complete with drive, motor, starter and supports from core bins and plows.
1—Return spill sand vibrating conveyor 12" wide by 25' long complete with supports, drive motor and starter.
1—6' x 12' x 8' high core sand (two compartment) core sand bin with shelf.
1—Steel ramp for core sand delivery 3' wide by 50' long with hand rail both sides.
1—Beardsley & Piper speedmullor with 3 cu. ft. vertical skip bucket loader complete with motors and starters.
1—Arbor dip tank for cooling arbors with lever arrangement for ejecting arbors to core spinning machine.
1—60 ft. ton Cleveland tramrail (electrified) and with "Budget" 500# capacity electric hoist, trolley, and arbor bail for returning twelve arbors at a time to core machines from pouring station.
60—Arbors for 4" standard pipe.
60—Arbors for 3" standard pipe.

FLASK AND PATTERN EQUIPMENT

45—Copes and 45 drags 8" x 36" x 72" inside, with hardened bushings. Flasks have cast steel sections and are made so that core arbors can be removed from pipe in flask after pouring. All flasks barred. Flask cost in 1947 was over $300.00 per pair and they were used approximately 4 months.
2—Sets of 2 each metal soil pipe patterns mounted on solid 2" steel plate. Patterns for 3" x 4" x 5" standard weight pipe. These mounts were used on Beardsley-Piper Champion Speed Draw machines.
Lot aluminum patterns—unfinished.
Lot bottom boards.
335 pieces core arbors for fittings ¼ and ⅛ bends, Y's dtc.
Lot soil pipe patterns for fittings.

OTHER ITEMS

Soil pipe conveyor hangers
19—Drums pipe coating
Std. #33 HD single end snag grinder 10HP motor #39099
Rails and stands 3 places
1—Champion jolt squeezer mold mach. #7702
1—Royersford 42 x 72 tumble bbl. 10HP motor
1—Royersford 42 x 72 tumble bbl. 10HP motor
1—3HP pump and motor
1—Std. #33 HD single end grinder 10HP #39098
1—Overhead crane system 2/ loadlifters (2) elec. cranes and runway
1—Conveyor frame and parts
Lot of scrap
Lot approx. 100 bags grundite
2—Whiting ladle cars with 2HP motors
1—pouring ladle with hoist
1—New Hill metal pouring ladle with extra cover
5—Industrial equipment pouring ladles
4—Asst. hangers
1—Beardsley & Piper champion speed draw mach. (CDS-119488)
1—Same #CDS-110488
1—Beardsley & Piper skip hoist (2HP motor)
1—Champion jolt squeeze mold machine #7622
Lot assorted sand in room
24—Metal jackets
5—Assorted wood snap flasks
1—3 section parts storage shelf
Lot 14 assorted conveyor rolls
6—Large Hanna Cylinders
1—Hanna cylinder
10—Assorted air cylinders and Hydraulic Cylinders
66—Assorted valves
28—Assorted valves
4—Hanna air cylinders
16—Assorted air and hydraulic cylinders
6—Assorted hydraulic and air cylinders
1—Hydraulic unit
4—Sectional metal shelving
Lot Scrap
Lot Contents of shed (Conveyor buckets, etc.)
Lot Contents of shed (arbors, boards, etc.)
Lot Scrap on side of bldg. (pipe, bars etc.)
Lot of scrap
1—Hayward 1½ yd. clam shell (motor) #14580
1—Beardsley & Piper 2 ton plate feeder & hopper (drive-no motor)
Lot of coke and stone in yard
75' Span 200' runway 40' high Whiting AC 7½ Ton crane with D.C. motor gen. with runway.
1—#8 Whiting Cupola

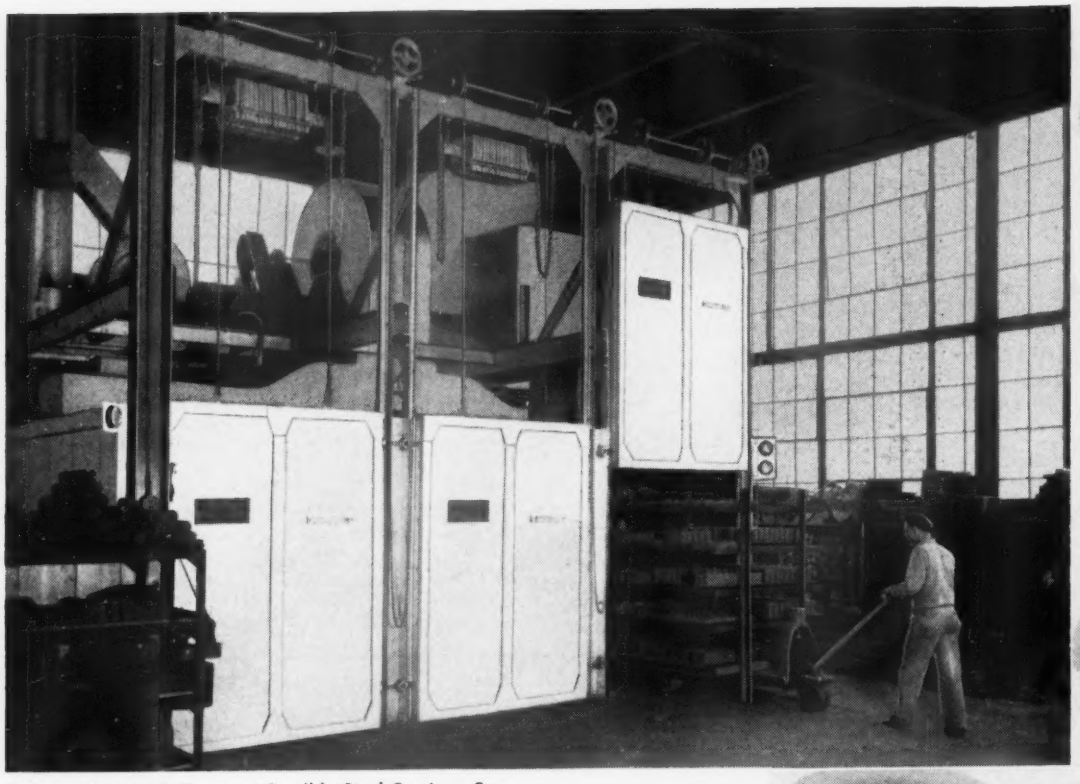
This foundry was designed to produce cast iron soil pipe and the equipment listed in the first two lists is particularly adapted to the production of soil pipe and should be sold in units as listed.

Above equipment not in use over five months and all in excellent condition.

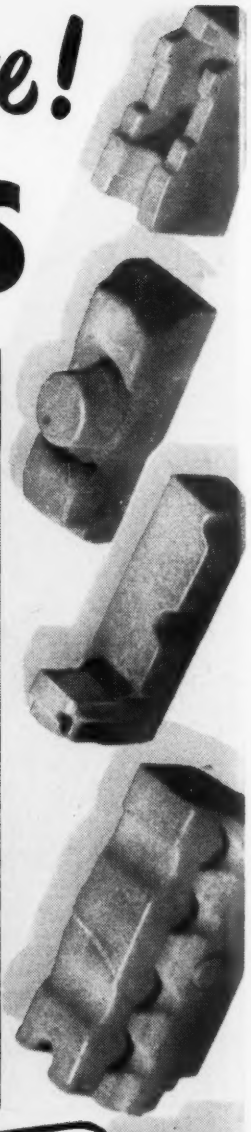
DAYTON STEEL FOUNDRY CO.
DAYTON, OHIO
ATTEN.: MR. F. A. FENSEL

more production...less waste!

COLEMAN OVENS



Coleman Transrack Ovens at Crucible Steel Castings Co.



● Coleman Transrack Core Ovens enable you to produce more uniformly baked cores and obtain increased production of more, better quality castings. Perfect baking eliminates core and casting scrappage . . . saves valuable materials, time and manpower.

Coleman Transrack Core Ovens, for use with hand or power lift trucks, are particularly efficient where ample floor space is available. Dependable baking results in uniformly better cores . . . increases core production and lowers costs.

Coleman Ovens are built in all conventional types and sizes as well as specially engineered installations to meet every operating requirement. There is a type of Coleman Oven to help give you maximum production on every core baking or mold drying job. Write today for Bulletin 48.

Only COLEMAN OVENS offer all these advantages:

- PERFECT DRYING AND BAKING eliminate manpower and casting losses due to make-overs and rejects.
- INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.
- HEAVY DUTY-CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost.
- GREATEST SAVINGS IN FUEL by using the most economical fuel available.
- MOST ECONOMICAL CORE BINDERS for your particular casting requirements, oil or resin, can be used.

A COMPLETE RANGE OF TYPES: COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD — CLEVELAND 13, OHIO

MEMBER FEMA

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

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MAINTENANCE MAN ATTACHES CLIPS OF TESTING INSTRUMENT TO CALIBRATION TERMINALS

New G-E Pyrometer Equipment Quick and Easy to Inspect and Maintain

Routine inspections of the new General Electric Type HP pyrometers can be made in the most time-saving ways—as these illustrations show.

Besides making preventative maintenance easy, this equipment has many other features to provide accurate indication and temperature control of furnaces, ovens, kilns, and other industrial-heating equipment.

ACCURATE INDICATION. Calibrated accuracy is within ¾ of 1 per cent of full scale. Automatic cold-junction compensation adjusts for changes in ambient.

CLOSE TEMPERATURE CONTROL. Any change in temperature, even as small as 0.1% full scale, starts immediate control action. Normal changes in humidity, ambient, and voltage have little or no effect on the exactness of control action.

DEPENDABLE OPERATION. Strong construction throughout makes G-E pyrometer equipment exceptionally rugged. A 3¼ pound alnico magnet provides high flux density and allows large air gaps. Lightweight moving system effectively resists shocks and vibration.

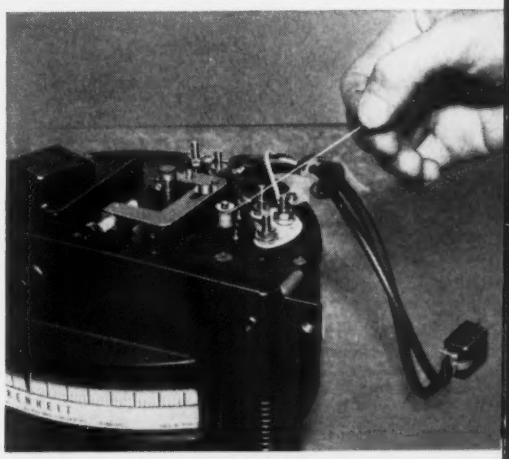
FOUR TYPES AVAILABLE—indicating, protecting, two- and three-position control forms. Both flush and surface mountings can be supplied. All models are available in a variety of temperature ranges in the 0–3000 F span.

For more information, call your G-E representative or write for Bulletin GEC-713. General Electric also offers a complete line of thermocouples—described in GEC-714. Write Section 602-208, General Electric Company, Schenectady, New York.

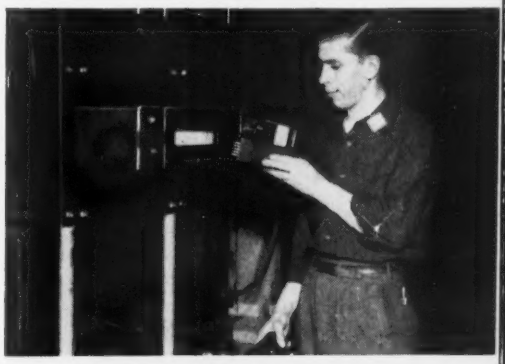
GENERAL ELECTRIC

602-208

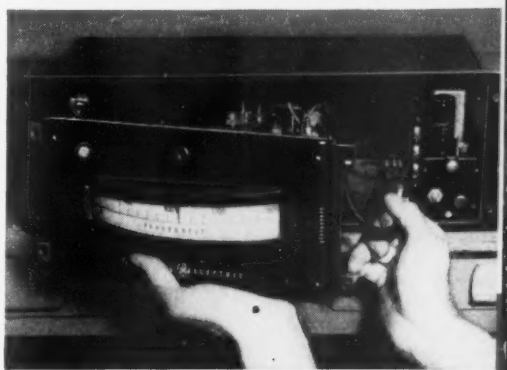
CALIBRATION CHECKS are made quickly and without disassembling pyrometer. First, remove right-hand panel. Then attach the clips to the terminals—as shown on left.



LEAD-LENGTH RESISTANCE can be changed conveniently when pyrometer is switched to another job. Simply adjust the lead-length spool mounted on top of indicator.

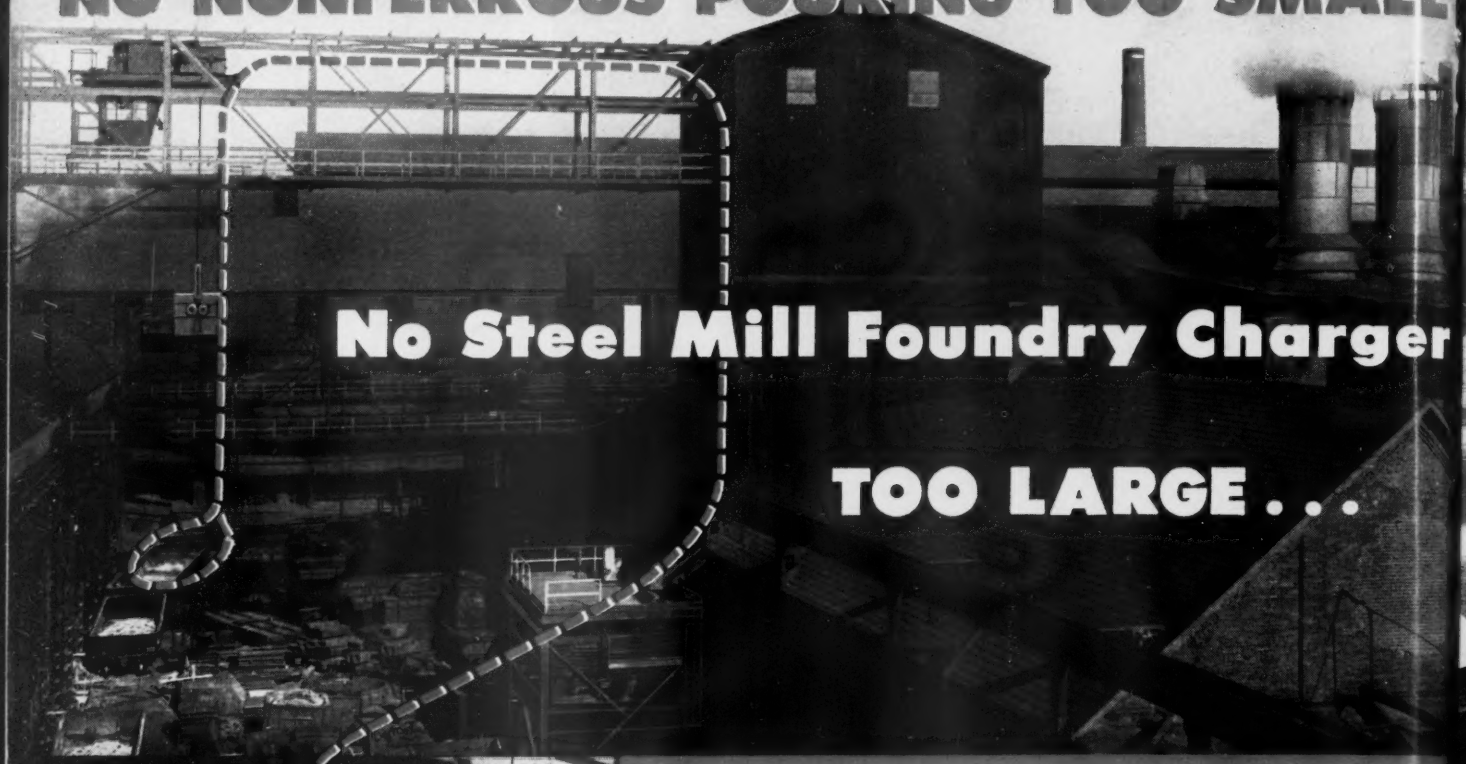


PLUG-IN CONTROLLER permits easy replacement if failure occurs. Both the controller and the protector units have plugs directly attached. Just slide the unit in place.

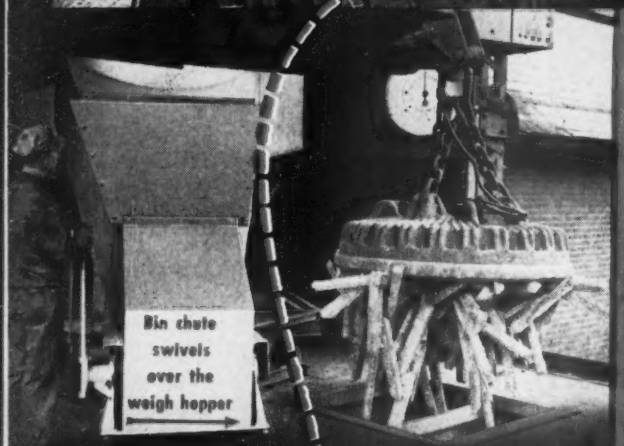


INDICATOR EASILY CHECKED or very quickly replaced if the need arises. The unit is connected to the terminal board by means of a plug on a short length of cord.

NO NONFERROUS POURING TOO SMALL



No Steel Mill Foundry Charger TOO LARGE . . .



Coke and stone, unloaded by a MODERN crane and gravity fed to a MODERN weigh hopper simplifies charging through the MODERN SMALL-CONE cupola bucket.

WORKING TOGETHER with practical foundrymen MODERN engineers pioneered mechanical pouring in the small foundry. Then all down through the years for more than thirty years one outstanding achievement blazed the way for another and a tougher job. . . .

Typical of the range and flexibility of today's mechanical charging is this 100% MODERN system shown in operation here. Coke and stone, from gondola cars, flows to cupolas without interruption. Every operation from MODERN yard-crane to SMALL-CONE SIDE-DISCHARGING bucket has been synchronized to reduce handling cost and further boost the temperature of metal poured.

More complete details will be mailed on request. Just return the coupon for catalogs or free loan of MODERN sound, color, motion, picture films. . . . .

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PORT WASHINGTON, WISCONSIN

MODERN EQUIPMENT COMPANY
Dept. F-8, Port Washington, Wisconsin
Without cost or obligation mail:
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Cupolas and cupola chargers 147A ☐
Cranes and monorail systems 150 ☐
More information on FREE use of MODERN films ☐

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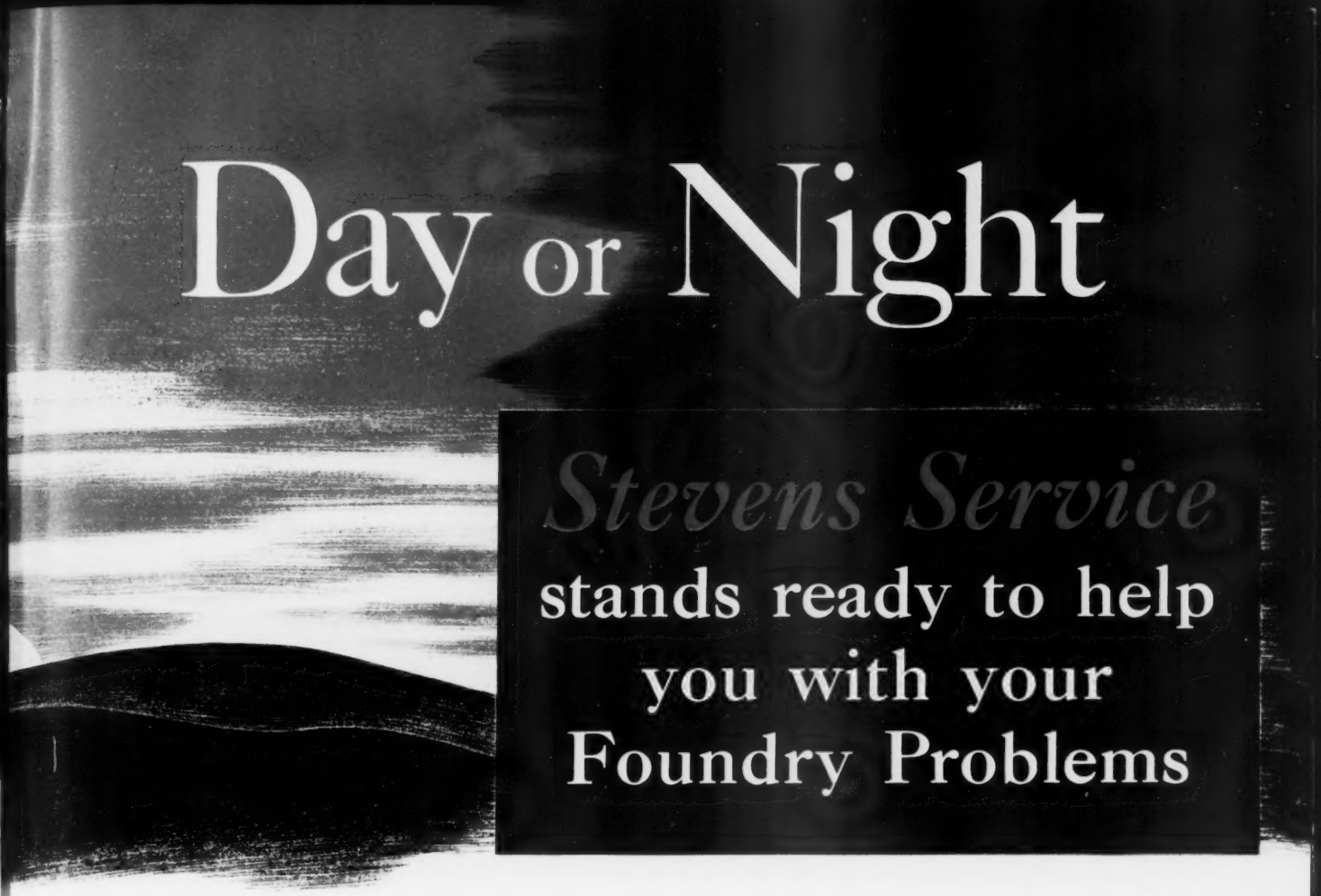

Day or Night

Stevens Service stands ready to help you with your Foundry Problems

Foundrymen all over the nation will attest that Stevens service extends all the way down the line – from the initial sale of a product through to guaranteed satisfaction with the results. As one of Stevens customers put it in his own words – "The Stevens organization gives top-notch service. You can call on the Stevens people at any hour, day or night, and get immediate action on foundry problems."

This same opinion is widely shared in the foundry industry. For over fifty years Frederic B. Stevens, Inc., have made prompt action their creed. From the first beginnings, Stevens has stood ready at all times to render service to foundrymen. Orders are handled with dispatch. Products are guaranteed to meet representation. Technical assistance in selecting the right product to meet specific requirements is extended to our customers. And Stevens Research, Development and Control program is at your service constantly to help you achieve better casting results at lower cost. If you have a problem in foundry operation, Stevens can give you the right answer. So call in your nearby Stevens representative or write direct to *Frederic B. Stevens, Inc., Detroit 16, Michigan.* We welcome your inquiries and there's no obligation.

EVERYTHING FOR A FOUNDRY

FREDERIC B. STEVENS INCORPORATED

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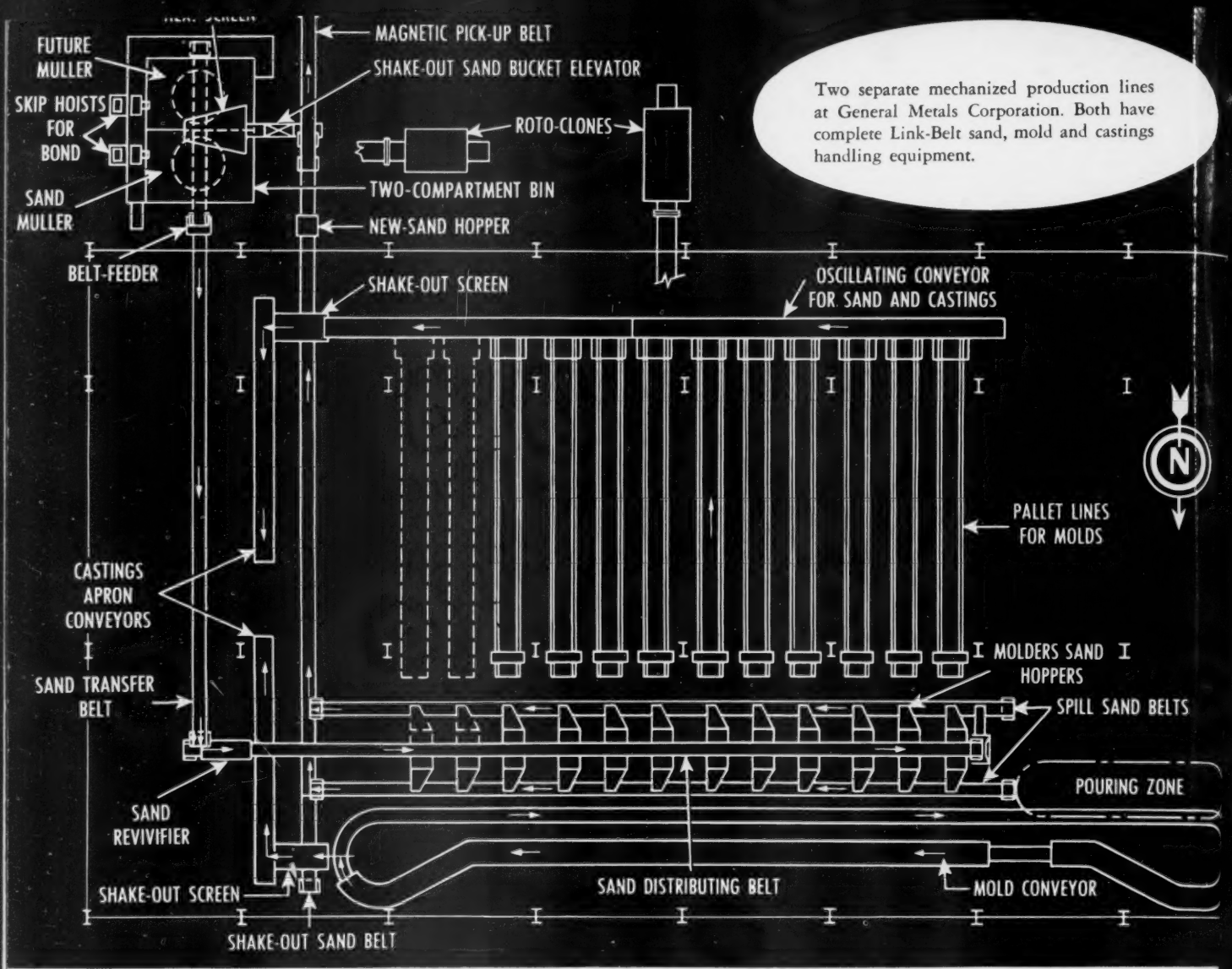
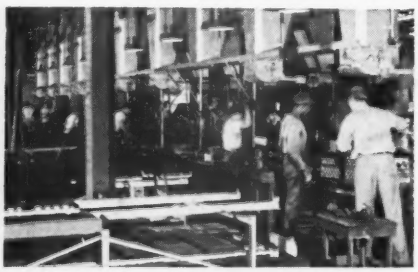


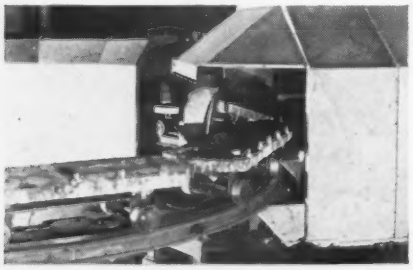
Two separate mechanized production lines at General Metals Corporation. Both have complete Link-Belt sand, mold and castings handling equipment.

How to get the ideal foundry

PA Oscillating Conveyor carries sand and castings to the south shakeout. Note the dust hood.



South line of molders is served by unique pallet lines which automatically return bottom boards to stations. Note molders' hoppers with duplex gates.



North line molds move on 335 ft. Tru-Trac conveyor. Molds but not bottom boards are automatically dumped into Link-Belt CA Foundry Shakeout.

General Metals of Los Angeles erects building around straight-line production equipment built by LINK-BELT

Not every foundry has a chance to start off with a model layout. But General Metals did . . . and they took advantage of it.

Before ground was broken, they called in Link-Belt foundry engineers. Then they erected the building to fit the layout . . . installed Link-Belt sand, mold and castings handling equipment.

Today, General Metals turns out good castings in quantity at a minimum cost. And their foundry is a desirable place to work in — clear air, clean floors, with a minimum of physical labor.

Even though you can't start from scratch, you may find that Link-Belt planning and Link-Belt equipment can increase production in your foundry without extra space. Why not have a Link-Belt foundry specialist call on you?

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

12,466

LINK-BELT

CONVEYORS and PREPARATION MACHINERY